



C.S.O. 8871/1/1 06



British Guiana.

REPORT

OF THE

DIRECTOR OF MEDICAL SERVICES,

FOR THE YEAR

1938.

By order of the Authority of His Excellency the Governor.

GEORGETOWN, DEMERARA.

PRINTED AND SOLD BY THE GOVERNMENT OF BRITISH GUIANA.

1940

No.



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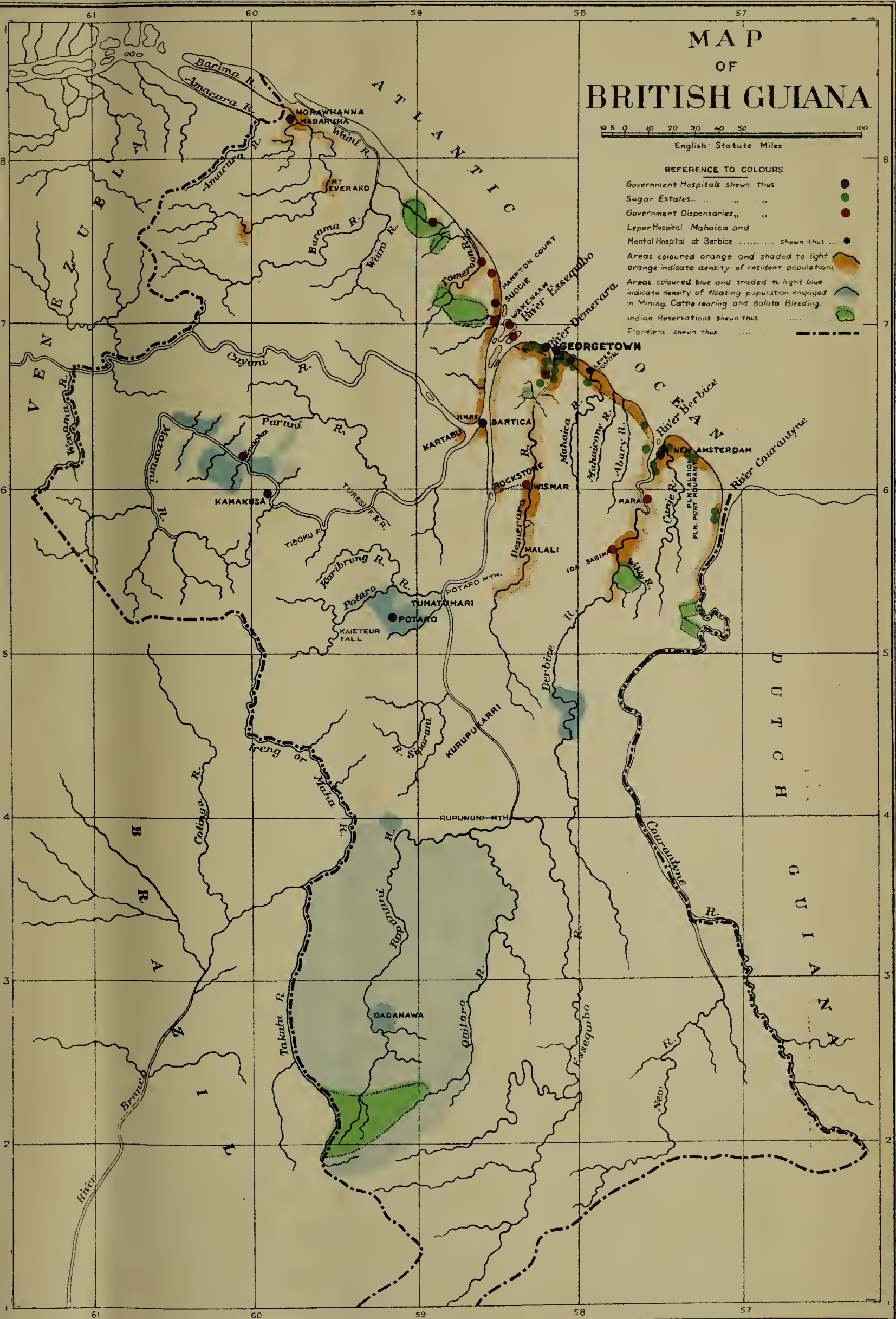
1938

MAP OF BRITISH GUIANA

0 5 10 20 30 40 50 100
English Statute Miles

REFERENCE TO COLOURS

- Government Hospitals shewn thus ●
- Sugar Estates ■
- Government Dispensaries ●
- Leper Hospital Mahaica and Mental Hospital at Barbice ● Shewn thus
- Areas coloured orange and shaded to light orange indicate density of resident population
- Areas coloured blue and shaded to light blue indicate density of floating population engaged in Mining, Cattle rearing and Balata Bleeding.
- Indian Reservations shewn thus ■
- Frontiers shewn thus ---





ERRATA.

Page 84 : Table LVII on this page should read Table LX.

Pages 85-95 : ditto.

Page 109 : The heading "XVII—SCIENTIFIC" should appear over paragraph 455.

CONTENTS.

	PAGE.	PARAGRAPH.
I.—ADMINISTRATION—		
A.—MEDICAL—		
Medical Staff ...	1	1
Distribution of Government Medical Officers on 31st December, 1938 ...	2	2
Appointments ...	3	3-7
Temporary and Acting Appointments ...	3	8-17
Secondments ...	3	18-19
Retirements and Resignations ...	4	20-21
Deaths ...	4	22
Nursing Staff ...	4	23-26
B.—LEGISLATION—		
Medical Ordinances, Regulations, etc. ...	4	27-28
C.—FINANCIAL—		
Expenditure and Revenue ...	4	29-30
II.—VITAL STATISTICS ...	5	31-55
III.—PUBLIC HEALTH—		
A.—General Remarks ...	12	56-59
B.—GENERAL DISEASES—		
Nephritis ...	13	60
Respiratory Diseases ...	14	61
Bronchitis and Broncho-Pneumonia ...	14	62
Diseases of the Heart ...	14	63
Bowel Diseases (excluding the Enterics and Dysenteries) ...	14	64
Cancer and other malignant tumours ...	14	65-68
Comparative statement of diseases and deaths ...	15	69-71
Rainfall ...	15	72
C.—COMMUNICABLE DISEASES—		
Introduction ...	16	73
Malaria (General and Epidemic) ...	16	74-89
Influenza ...	20	90-91
Tuberculosis ...	20	92-93
Enteric Group ...	22	94-96
Chicken Pox... ..	22	97
Diphtheria ...	22	98-100
Graphic records of Enteric Fever, Diphtheria and Chicken Pox... ..	23	101
Yellow Fever ...	25	102-106
Anthrax ...	26	107
Acute Anterior Poliomyelitis ...	26	108
Puerperal Fever ...	26	109-110
Small Pox—Vaccinations ...	26	111-117
Trachoma ...	27	118
Leprospirosis ...	27	119
Tetanus ...	27	120
Yaws ...	27	121
Ancylostomiasis ...	27	122
Venereal Diseases ...	28	123-141
Leprosy ...	35	142-146
Filariasis ...	42	147-150
Erysipelas ...	43	151
Ophthalmia Neonatorum ...	43	152
Quarantinable Diseases ...	43	153
IV.—HYGIENE AND SANITATION—		
CENTRAL BOARD OF HEALTH—		
Record of activities and annual statement ...	43	154-170

IV.—HYGIENE AND SANITATION—(CONTD.)—	PAGE.	PARAGRAPH.
GENERAL PREVENTIVE MEASURES—		
Details of work of sanitary inspectors ...	45	171-173
Routine departmental activity... ..	46	174-175
Housing and Town Planning	46	176-185
Water Supplies	48	186-192
Drainage	49	193-194
Sewage Disposal	50	195
Trades and Industries	50	196-197
SPECIAL PREVENTIVE MEASURES—		
Milk Testing... ..	50	198-201
Bonification	50	202
Other Sanitary Works	50	203
Village Sanitation	50	204-207
YELLOW FEVER... ..	51	208-213
V.—PORT HEALTH WORK AND ADMINISTRATION	52	214-231
VI.—INFANT WELFARE AND MATERNITY...	54	232-244
VII.—SCHOOL MEDICAL AND DENTAL SERVICES	58	245-264
VIII.—NUTRITION	61	265-279
IX.—HOSPITALS AND DISPENSARIES—		
A.—HOSPITALS	63	280-318
Ophthalmic Department	78	319-326
Dental Department	79	327-334
X-Ray and Electrical Department	79	335-347
Table LVIII. showing accommodation, etc., for patients in public hospitals	81	—
Graph XV. showing admissions and deaths—Combined Public Hospitals	82	—
Table LIX. showing classification of in-patients and out-patients..	83	—
Table LX. showing diseases of out-patients and diseases and deaths of in-patients	84	—
Table LXI.—Surgical Operations	98	—
B.—THE MENTAL HOSPITAL	98	348-360
C.—PUBLIC DISPENSARIES	99	361-362
X.—PRISONS	100	363-385
XI.—THE ALMS HOUSE	102	386-395
XII.—INDUSTRIAL SCHOOL, ONDERNEEMING	102	396-405
XIII.—SUGAR ESTATES	103	406-418
XIV.—MINING—		
A.—MAZARUNI DIAMOND FIELDS	106	419-429
B.—POTARO HOSPITAL AND DISPENSARY	107	430-432
C.—MCKENZIE HOSPITAL—		
Demerara Bauxite Company—Demerara River	107	433-438
D.—BRITISH GUIANA CONSOLIDATED GOLD FIELDS, POTARO	107	439-447
XV.—HINTERLAND SETTLEMENTS	108	448-451
XVI.—METEOROLOGICAL	108	452-454
XVII.—SCIENTIFIC	109	455

APPENDICES.

APPENDIX I.—	PAGE.
(a) Report of the Government Central Laboratories for the year 1938 ...	110
(b) Report on Nutritional Anaemias in British Guiana by the Government Bacteriologist	116
APPENDIX II.—Malaria in British Guiana by G. Giglioli, M.D. ...	118
APPENDIX III.—Supplement—Vital Statistics 1900-1937 ...	140

MEDICAL DEPARTMENT,
GEORGETOWN, DEMERARA,
12th October, 1939.

SIR,

I have the honour to submit, for the information of His Excellency the Governor and the Legislative Council and for transmission to the Right Honourable the Secretary of State for the Colonies, the medical report on the health and sanitary conditions of British Guiana for the year 1938, together with the returns, etc., appended thereto.

I have the honour to be,

Sir,

Your obedient Servant,

NORMAN M. MACLENNAN,
Director of Medical Services.

The Honourable
The Colonial Secretary.

BRITISH GUIANA.

ANNUAL MEDICAL REPORT FOR THE YEAR ENDING 31st
DECEMBER, 1938.

I.—ADMINISTRATION.

A.—*Medical Staff.*

1. The Medical Staff as authorised by the Estimate for 1938 consists of :—
 - 1 Director of Medical Services.
 - 1 Government Medical Officer of Health.
 - 3 Assistant Government Medical Officers of Health.
 - 1 Bacteriologist and Pathologist.
 - 1 Surgeon-Specialist and Resident Surgeon, Public Hospital, Georgetown.
 - 1 Senior Physician, Public Hospital, Georgetown.
 - 1 Assistant Surgeon, Public Hospital, Georgetown.
 - 1 Medical Superintendent, Mental Hospital.
 - 1 Medical Superintendent, Leprosy Hospital.
 - 1 Ophthalmologist.
 - 24 Government Medical Officers.
 - 1 District Surgeon.
 - 2 Temporary Assistant Medical Officers.
2. The distribution of the staff on the 31st December, 1938, is shown in Table I.

TABLE 1.

Distribution of Government Medical Officers on the 31st December, 1938.

(1) Director of Medical Services.	(2) Government Public Health Department.	(3) Government Bacteriologist and Pathologist.	(4) Special Medical Appointments.	(5) X-Ray and Electrical Department.	(6) Officers in charge of Medical Institutions.	(7) Name of Institution and position of Medical Officer.	(8) Medical Officers attached to Institutions.	(9) Officers in charge of Institutions and Districts.	(10) Officers in charge of Medical Districts.	(11) Names of Institutions and Districts.	(12) Temporary Assistant Medical Officers.
Dr. Norman M. Mac- lennan (1).	(i) Government Medical Officer of Health and Port Health Officer, George- town—Dr. B. N. V. Wase-Bailey (2). (ii) Assistant Government Medical Officer of Health and Port Health Officer, New Amsterdam— Dr. P. A. T. Sneath (3). (iii) Assistant Government Medical Officer of Health and Deputy Port Health Officer, Georgetown— Dr. O. M. Fran- cois. (iv) (Vacant).	Dr. P. A. Clearkin (4)	(i) Surgeon Special- ist and Resident Surgeon, Public Hospital, George- town—Mr. J. D. Grierson, F.R.C.S. (ii) Senior Physician, Public Hospital, Georgetown—Dr. S. C. Bettencourt- Gomes. (iii) Assistant Sur- geon, Public Hos- pital, Georgetown —Mr. D. I. C. Fin- layson, F.R.C.S. (iv) Medical Super- intendent, Mental Hospital—Dr. A. W. H. Smith. (v) Medical Superin- tendent, Leprosy Hospital—Dr. F. G. Rose, M.B.E. (vi) Ophthalmolo- gist—Dr. J. A. Browne. (vii) Prison & Police Surgeon, and Medical Officer, No. 1 Dispensary and Alms House, Georgetown—Dr. D. J. Taitt.	Honorary Radi- ologist—Dr. F. G. Rose, M.B.E.	Dr. J. Glavina	Resident Sur- geon, Public Hospital, New Amsterdam, Berbice.	(i) Dr. E. G. H. Payne. (5) (ii) Dr. G. W. Mearns. (iii) Dr. W. W. Bes- son. (iv) Dr. S. T. M. Sang. (6) (v) Dr. H. Ho. (vi) Dr. N. J. Abben- setts. (vii) Dr. N. J. Dias. (viii) Dr. F. A. Viapree. (ix) Dr. L. S. Jalkaran. (1 vacancy).	(i) Dr. E. W. Reece. (ii) Dr. W. D. Pollard. (iii) Dr. C. Ramdeholl	(i) Dr. G. E. Carto (ii) Dr. J. E. R. Buxton. (iii) Dr. L. R. Shar- ples. (iv) Dr. R. N. Cozier (v) Dr. J. Nedd ... (vi) Dr. G. M. Kerry (vii) Dr. G. T. G. Mahaica. (viii) Dr. G. A. Boyce. (ix) Dr. O. R. Su- bryan. (x) Dr. L. H. Wharton (Dis- trict Surgeon).	Resident Surgeon, Public Hospital, Suddie, Medical Officer, Suddie District and On- derneening In- dustrial School. Resident Surgeon, Public Hospital, Bartica and Medi- cal Officer, Bar- ticia District. Resident Surgeon, Public Hospital, Mabaruma, and Medical Officer, North West Dis- trict. Canje-Highbury. Port Mourant. West Coast, Dem- erara. West Bank, Dem- erara. Peter's Hall. Cotton Tree. Skeldon. Mahaicony.	Dr. M. O. Luck. (1 vacancy).

(1) Dr. B. N. V. Wase-Bailey acted from 1st January to 27th September, 1938.

(2) Is also Deputy to the Director of Medical Services. Dr. P. A. T. Sneath acted from 23rd May to 27th September, and from 29th October to 31st December, 1938.

(3) Is also Honorary Medical Officer of Health for the town of New Amsterdam.

(4) Dr. E. G. H. Payne acted from 1st January to 28th August, 1938.

(5) Medical Officer in charge of Venereal Diseases Clinic, Public Hospital, Georgetown.

(6) Is also Visiting Medical Officer, Anna Regina, Pomeroy, and Wakenaam Dispensaries.

Appointments.

3. Dr. Norman M. MacLennan was appointed Director of Medical Services, *vice* Dr. J. A. Henderson, as from 9th September, 1938. He arrived in the Colony and assumed duty on 28th September, 1938.

4. Dr. S. C. Bettencourt-Gomes, Government Medical Officer, was appointed Senior Physician, Public Hospital, Georgetown, as from 1st January, 1938.

5. Dr. P. A. Clearkin was appointed Government Bacteriologist and Pathologist, *vice* Dr. G. H. Steven, as from 29th August, 1938, on which date he arrived in the Colony and assumed duty.

6. Dr. F. A. Viapree, District Surgeon, Mahaicony, and Dr. L. S. Jaikaran, acting Government Medical Officer, were appointed Government Medical Officers, as from 1st January, 1938.

7. Mr. G. H. Baird was appointed Assistant Radiographer, *vice* Mr. V. G. Connett, as from 11th May, 1938, on which date he arrived in the Colony and assumed duty.

Temporary and Acting Appointments.

8. Dr. B. N. V. Wase-Bailey, Government Medical Officer of Health, acted as Director of Medical Services from 1st January to 27th September.

9. Dr. P. A. T. Sneath, First Assistant Government Medical Officer of Health, acted as Government Medical Officer of Health, *vice* Dr. B. N. V. Wase-Bailey, from 23rd May to 27th September, and from 29th October to 31st December.

10. Dr. E. G. H. Payne, Government Medical Officer, acted as Government Bacteriologist and Pathologist from 1st January to 28th August, 1938, *vice* Dr. G. H. Steven.

11. Dr. M. O. Luck was reappointed a Temporary Assistant Medical Officer for one year as from 1st January. He acted as a Government Medical Officer from 9th January to 31st December.

12. Dr. C. C. Nicholson acted as a Temporary Assistant Medical Officer from 9th to 31st January, and as a Government Medical Officer from 1st February to 31st December.

13. Dr. P. G. Barrow acted as a Temporary Assistant Medical Officer from 10th February to 25th May and from 3rd October to 31st December. During the period 26th May to 2nd October, he acted as a Government Medical Officer.

14. Dr. J. W. D. Ferdinand acted as a Temporary Assistant Medical Officer as from 1st to 31st January and as a Government Medical Officer from 1st February to 31st December.

15. Dr. B. N. S. Gillette acted as a Temporary Assistant Medical Officer from 19th February to 30th June and from 14th September to 31st December. During the period 1st July to 13th September, he acted as a Government Medical Officer.

16. Dr. G. A. Grandsoult acted as Medical Superintendent, Leprosy Hospital, as from 1st February to 10th September, *vice* Dr. F. G. Rose, M.B.E., on leave.

17. Drs. R. Singh and L. H. Wharton acted as Government Medical Officers from 1st January to 17th October, and from 14th March to 31st December, respectively.

Secondments.

18. Dr. L. S. Jaikaran, Government Medical Officer, was seconded for duty as Medical Officer to the Nutrition Committee as from 14th March.

19. Mr. V. E. Carter, Class III Clerk, Public Hospital, Georgetown, was seconded for duty in the Public Works Department as from 1st June to 31st December.

Retirements and Resignations.

20. Dr. G. E. Carto, Government Medical Officer, retired from the Service on pension on 31st December.

21. Miss A. Killops, Divisional Sister, Public Hospital, Georgetown, resigned her appointment as from 1st December.

Deaths.

22. Miss M. Ridley, Matron, Public Hospital, Berbice, died on 27th July, 1938.

Nursing Staff.

23. Miss N. M. C. Horrocks, Superintendent of Nurses, Public Hospital, Georgetown, was granted four months' full pay vacation leave on the completion of her term of service as from 30th April, the date on which she left the Colony. She was succeeded by Miss Penelope Stewart, Matron of the General Hospital, Barbados, who arrived in the Colony and assumed duty on 4th November. During the interval between Miss Horrocks's departure and Miss Stewart's arrival the duties of Superintendent of Nurses were carried out by Miss F. F. N. James from 19th to 29th April, and by Miss M. Hepenstall from 30th April to 3rd November.

24. Miss F. F. N. James was granted four months' full pay leave as from 13th May, after completion of her term of service.

25. Miss A. Killops resigned her appointment as from 1st December.

26. Sisters Mary Marcella Kramer, Mary Benedict Clem, and Mary Geraldine Mock were appointed Nursing Sisters, Leprosy Hospital, Mahaica, as from 22nd May, 22nd May, and 17th September, respectively.

*B.—Legislation.**Ordinances, Regulations, etc.*

27. The following ordinance was passed during the year :—The Public Health (Amendment) Ordinance, 1938—An Ordinance to amend the Public Health Ordinance in certain particulars.

28. The following Orders in Council and Notices were issued during the year :—

- (a) Order under section 44 (1) of the Public Health Ordinance, No. 15 of 1934, to prevent the taking out or removal of milk from Plantation Sea Well and Palmyra in the County of Berbice by reason of the occurrence of bovine anthrax therein.
- (b) Order revoking the Order to prevent the taking out or removal of milk from Plantations Sea Well and Palmyra.
- (c) A Notice adding solanaceous alkaloids to Part I of Schedule I to the Pharmacy and Poisons Ordinance, Chapter 103.

C.—Financial.

29. The following is a comparative statement of revenue and expenditure for the years 1936, 1937, and 1938.

(a) Revenue—Medical Department.

1936.	1937.	1938.
\$40,700.83 (includes \$2,535.32 for rent of quarters occupied by Medical Officers).	\$38,048.40 (includes \$2,286.52 for rent of quarters occupied by Medical Officers).	\$47,332.30 (includes \$2,222.86 for rent of quarters occupied by Medical Officers).

(b) Expenditure—Medical Department, including Public Health Department.

1936.	1937.	1938.
\$564,307.02	\$570,233.00	\$621,778.14.

30. The percentage of actual expenditure on Medical and Public Health Services to actual revenue of the Colony was :—

1936.	1937.	1938.
10.3%	10.4%	9.8%

II.—VITAL STATISTICS.

General.

31. The year 1938 showed the greatest population movement since 1930 wherein 10,184 persons arrived in the Colony and 11,014 left the Colony, a loss to the total estimated population of 830 persons. The corresponding figures for 1937 were 9,931 and 9,650 persons respectively, there being for that year a gain in population of 281 persons by immigration. The most conspicuous item in this year's loss of population by emigration is associated with the repatriation of 880 East Indians. Combining all the factors of births, deaths, and migration from which the estimated population is calculated, there was a *net* loss of 34 Europeans (other than Portuguese), 79 Portuguese, 242 East Indians and 3 Blacks, whereas there was a *net* gain of 71 Chinese, 72 Aborigines, 689 of mixed races and 8 of other races. The total estimated population for 1938—337,521—showed an increase of 482 persons over that of last year—337,039 a rate of 0.14 per cent. on the estimated population of 1937 in contrast to an increase of 1.43 per cent. recorded for 1937. Without proceeding further it will be evident that this Colony suffered a distinct set-back in its natural increase during the year under review.

32. The crude birth rate fell from 33.3 per 1,000 population in 1937 to 29.7 for the current year. This is the lowest birth rate since 1934 and its cause may have similar explanation, although it should be observed that the recurrent annual fluctuations in registered births suggest that there is an evasion of the statutory obligation on the part of parents and others. Of the 10,016 registered births, 5,131 were males and 4,885 were females—a ratio of 105 males per 100 females. With a total of 11,227 births registered in 1937 the same sex distribution was to be observed during 1938.

33. The crude death rate of 25.8 per 1,000 population (8,704 deaths) is the highest since 1928, in contrast with a death rate of 21.9 for 1937 (7,367 deaths).

34. Perhaps one of the most comprehensible correlations of the two foregoing factors is the crude Vital Index or Births/Deaths Ratio calculated as a percentage. For 1938 this index was 115 births per 100 deaths, the contrasting index for 1937 being 151. The most nearly comparable figure of 116 births per 100 deaths is to be found for the year 1934. While this ratio necessarily involves a number of different factors which affect fecundity and death, it serves as a convenient measure of the Colony's biological well-being which since 1920 has been subject to cyclic recessions, the year 1938 being the fourth such instance during that interval.

35. The contributory reasons for these adverse conditions wherein the year 1938 shows 1,337 more deaths than occurred in 1937 have significant explanation in specific causes of death. The reduced birth rate is not explained by an accompanying increase in the stillbirth rate which was 57 per 1,000 live births in contrast to a rate of 58 in 1937. For this reason it would appear probable that the conditions concerned with the lowered birth rate must be associated with abnormal factors affecting conception, early pregnancy and possibly maternal mortality, rather than congenital disease causing a failure to produce living children.

Infant Mortality.

36. The infant mortality rate (166 per 1,000 births) is the highest since 1934, when the corresponding rate was 168 per 1,000 births. This rate was 121 in 1937.

37. From a calculation based upon the respective infant mortality rates, the relative significance of the several specified causes of infant deaths is shown in

Table II. These totalled 1,661 during the year under review compared with a total of 1,359 infant deaths in 1937.

TABLE II.
CALCULATED CHIEF CAUSES OF INFANT MORTALITY RATE.

Causes of Deaths.	1937.		1938.	
	No.	%	No.	%
Diseases of early infancy (158-161)...	58	48	73	44
Malaria and Undefined Fevers (38)...	13	11	35	21
Respiratory Infections (11, 106, 107-109) ...	15	12	23	14
Intestinal Infections (13, 119, 120) ...	13	11	18	11
Other causes of death ...	22	18	17	10
Deaths per 1,000 births ...	121	...	166	...

(The figures in parentheses have reference to the rubrics of the Fourth Revision of the International List of Causes of Deaths, 1929).

38. The outstanding increase in causes of infant deaths in the year under review was malaria and undefined fevers which accounted for 347 deaths in contrast to 152 deaths from those causes in 1937. The aetiological indefiniteness of the terms congenital debility and premature birth which are the major items in the diseases of early infancy precludes explanation of the apparent proportional reduction of this cause of death in 1938 when it accounted for 732 deaths in contrast to 840 deaths from this cause in 1937.

39. The less imposing increased proportion of deaths from the respiratory diseases during 1938 arises from influenza, bronchitis and the pneumonias which caused 230 deaths in contrast with 174 such deaths in 1937. Infantile convulsions caused 38 deaths during the current year compared with 13 deaths from that cause during 1937. Four deaths from tetanus and five deaths from unspecified diseases due to helminths are reported in 1938, which conditions were not to be found in the 1937 records.

40. The general mortality showed a net increase of 1,337 deaths over that of 1937. Since the estimated population for purposes of calculation is practically constant, it is possible to deduct the excess infant deaths (302) from the foregoing figure and thereby show that there were 1,035 more deaths in the age groups from 1 year onwards than in 1937.

Mortality in Age Groups Over 1 Year.

41. The infectious and parasitic diseases, diseases of the respiratory system and non-venereal diseases of the genito-urinary system maintained their relative position as the three leading groups of causes of deaths. The two former represented identical proportions of all causes of deaths in 1937 and 1938 (25.8 per cent. and 19 per cent. respectively), the third group, which in 1937 represented 11.8 per cent., during the year under review fell to 10.7 per cent. These three groups account for approximately one-half of all the excess deaths. Diseases of the digestive system were responsible for 8.3 per cent. of the deaths during 1938, the fourth chief cause of death, having risen from the sixth place in 1937 when this group involved 6.6 per cent. of the deaths. The fifth group in 1938 was diseases of the circulatory system concerned with 7.5 per cent. of the deaths, which particular group was fourth in the 1937 sequence then representing 8 per cent. of all the deaths in persons over 1 year of age.

TABLE III.

CHIEF CAUSES OF DEATH—AGE GROUP OVER 1 YEAR.

Causes of Death.	1937.		1938.	
	No.	%	No.	%
Respiratory Infections (11, 106, 107-109) ...	816	13.6	1,101	15.6
Malaria, Blackwater and Undefined Fevers (38, 44) ...	836	13.9	997	14.2
All Forms of Nephritis (130-132) ...	622	10.4	671	9.5
Acute Intestinal Infections (13, 119, 120) ...	339	5.6	544	7.7
Diseases of the Circulatory System (90-103) ...	481	8.0	626	7.5
Old Age (162) ...	443	7.4	504	7.2
Other Causes of Death ...	2,471	41.1	2,700	38.3
Total ...	6,008	100	7,043	100

(The figures in parentheses have reference to the rubrics of the Fourth Revision of the International List of Causes of Deaths, 1929).

42. The diagnoses constituting the acute intestinal infections are of such a non-specific nature that they may reflect certain of the more specific causes, but it should be noted that there was no increased occurrence of deaths from typhoid or the paratyphoids which diseases are not included in this computation.

43. Analysis of the age groups above one year shows that the excess deaths in 1938 affected the 1—5 year group most seriously, then the 15—45 year group and less seriously the 5—15 year group. There were proportionately fewer deaths in the age group above 45 than in 1937. A greater proportion of all the deaths occurred in males (52.5 per cent.) than in 1937 when the corresponding proportion was 51.2 per cent. It should be noted that a truer perspective of the situation indicated in these statements would be possible if the data for age-specific mortality rates had been available.

• *Maternal Mortality.*

44. With 152 deaths associated with pregnancy the maternal mortality rate was 15.2 per 1,000 births compared with 12.7 in 1937 (143 deaths). Since 1936, an anomaly in classification has occurred wherein the rubric "Puerperal Haemorrhage" has included deaths from the clinically recognised anaemias of pregnancy. Prior to that time the latter were allocated under the rubric "Other Accidents of Pregnancy" (148-149). Since it is not certain that this condition is peculiar to the puerperal state, it has been assigned to "Other Conditions" (150). For that reason Table IV. is submitted to show this adjustment for the 1936 and 1937 returns as comparison to the situation to be found in 1938.

TABLE IV.

CAUSES OF MATERNAL MORTALITY.

Disease Groups.	1936.		1937.		1938.	
	No.	%	No.	%	No.	%
Accidents of Pregnancy (140-143) ...	9	5.6	7	4.9	27	17.8
Puerperal Haemorrhage (144) ...	14	8.7	12	8.4	18	11.8
Puerperal Sepsis (145) ...	27	16.9	15	10.5	13	8.6
Toxaemias of Pregnancy (146-147) ...	47	29.4	44	30.8	38	25.0
Other Accidents of Childbirth (148-149) ...	11	6.9	16	11.2	10	6.6
Other Conditions (150) ...	52	32.5	49	34.3	46	30.3
Total ...	160	100	143	100	152	100

(Numbers in parentheses have reference to the rubrics of the Fourth Revision of the International List of Causes of Death, 1929).

45. The maternal mortality rate for 1938 is the highest since 1928 and probably may be associated with the abnormal prevalence of the acute conditions indicated under the general mortality. Although puerperal sepsis may here be viewed as

notably low, it cannot fail to be observed that there is an excessive mortality from the toxaemias of pregnancy and other conditions in the latter category of which the anaemias of pregnancy are known to be an important element. With nearly 700 registered midwives in the Colony, Government Medical Officers, and public and estate hospitals within reasonable range of the vast majority of the coastal population, an explanation may be found in the fact that the women of this Colony are not concerned with the early treatment of the abnormalities of pregnancy. Mutual confidence and understanding between attendant and patient which can foster such a necessary change of viewpoint is more a matter of personality than an increase in personnel. The practice of midwives in this Colony has not moved with the times. Experience indicates that the complications of pregnancy have late reference to hospital. The reason therefore must be found in ignorance and carelessness.

GRAPH I.

CHIEF CAUSES OF DEATH

BRITISH GUIANA

1938



TABLE V.

46. MORTALITY RATES. CHIEF CAUSES OF DEATHS—ALL AGES. BRITISH GUIANA—
PER 10,000 POPULATION.

Groups. (Bracketed figures refer to International List of Causes of Deaths, 1929).	1937.		1938.	
	No.	Rate.	No.	Rate.
(1) Malaria, Blackwater and Undefined Fevers (33, 44) ...	1,090	32.3	1,344	39.8
(2) Respiratory Infections (11, 106-109) ...	990	29.4	1,331	39.4
(3) Acute Intestinal Infections (13, 119, 120) ...	482	14.3	733	21.7
(4) Diseases of Early Infancy (158-161) ...	640	19.0	732	21.7
(5) All forms of Nephritis (130-132) ...	626	18.6	673	19.9
(6) Diseases of the Circulatory System (90-103) ...	481	14.3	526	15.6
(7) Old Age (162) ...	443	13.1	504	14.9
(8) Diseases of the Nervous System (78-89) ...	385	11.4	456	13.6
(9) All forms of Tuberculosis (23-32) ...	298	8.8	277	8.2
(10) Deaths from Violence (163-193) ...	175	5.2	157	4.7
(11) Cancer and Other Tumours (45-55) ...	147	4.4	144	4.3
(12) Other Causes ...	1,610	47.8	1,827	54.1
Total ...	7,367	...	8,704	...

Summary.

47. Since there may be a tendency to over emphasise the importance of certain diseases and disease groups, Table V, is submitted with the object of indicating the relative importance of various diseases and conditions as causes of death in the Colony. Some of these are controllable and as such indicate what proportion of effort should be directed to that end. In spite of all efforts deaths must inevitably occur. The objectives of preventive medicine are ideally directed toward postponing that end. Epidemic and acute communicable diseases are remarkably insignificant as causes of death in British Guiana. Those conditions indicated in the Table require no further emphasis than an appreciation of the fact that these deaths and the proportionate distribution of non-fatal illness from the same causes, where illness is involved, represent a tremendous cost and wastage to the Colony. Reasons for concentrating efforts upon those conditions that are controllable are beyond argument. These efforts require more than acquiescence by the public. They demand general co-operation.

2.—Urban Districts of Georgetown and New Amsterdam.

48. Under the present system of compilation it has not been possible to assemble tables for these municipalities which permit identical comparison with the groupings submitted for the Colony as a whole. In view of the fact that there are public hospitals and other institutions in which deaths occur of persons who are not regular residents of the respective municipalities but which deaths are nevertheless registered as occurring in those areas, the following records have been "corrected" to eliminate this factor of distortion. It has not been the practice to re-allocate births and stillbirths to ensure similar precision. The crude rates concerned with these events must therefore be considered as subject to correction on the basis of residence of the mother if a comparably accurate perspective were to be obtained. The latter are tabulated herewith.

TABLE VI.

Specific Rates—Urban Sanitary Districts.	Georgetown.		New Amsterdam.	
	1937.	1938.	1937.	1938.
Infant Mortality Rate per 1,000 births ...	103	119	104	154
Stillbirth ...	70	63	12	11
Maternal Mortality " " " (1) ...	9	10	9	13
Birth Rate per 10,000 population ...	312	288	350	316
Birth/Death Ratio (Vital Index per 100 deaths) (2) ...	151	138	161	115

(1) Corrected.

(2) "Death factor" corrected.

49. The absolute and relative significance of the specific rates shown in Table VI cannot be fairly considered to convey an accurate picture of these factors as

they concern the resident populations of the two municipalities, because of the fact that there are public hospitals in both these places which serve a wide section of the countryside as well as the municipalities. It therefore follows the abnormalities indicated by these rates only warrant the observation that there was a definite deterioration during 1938 which was of greater severity in New Amsterdam.

Chief Causes of Death.

50. *Georgetown.*—There was only a fractional alteration in the crude mortality rates in the years 1937 and 1938 but during 1938 there was a dislocation in the array of the chief causes of death. The most conspicuous increase in mortality rate is to be noted under respiratory diseases. The relative importance of the diseases of early infancy remained as in 1937 but an increased mortality rate is to be observed. While there is a change in the position of old age as a cause of death, it should be realised that the existence of the Alms House in Georgetown must necessarily make this factor of more significance than would otherwise be the case. Intestinal infections assumed a much more important position in the 1938 experience, and malaria and undefined fevers continued to be within the first six causes of death, although the mortality rate was less than in 1937. A notable reduction in the position of tuberculosis from fourth place to seventh place is to be observed, supported by a distinct reduction in the mortality rate.

51. *New Amsterdam.*—There was a marked increase in the crude mortality rate in this community during 1938, the reasons for which are to be observed chiefly in the first four causes of death.

TABLE VII.

GEORGETOWN.

Chief Causes of Death. Rate per 10,000 population.	1937.		1938.	
	No.	Rate.	No.	Rate.
(1) Respiratory Infections (11, 106-109) ...	139	20·6	172	25·4
(2) Diseases of Circulatory Systems (90-103) ...	152	22·5	133	19·7
(3) Diseases of Early Infancy (158-161) ...	107	15·9	117	17·3
(4) Old Age (162) ...	74	11·0	97	14·4
(5) Intestinal Infections (13, 119, 120) ...	50	7·4	82	12·1
(6) Malaria, Blackwater and Undefined Fevers (38 and 44) ...	87	12·9	79	11·7
(7) All forms of Tuberculosis (23-32) ...	107	15·9	78	11·5
(8) Cancer and Other Tumours (45-55) ...	57	8·5	48	7·1
(9) Other Causes ...	580	86·0	551	81·5
Total ...	1,353	201·	1,357	201·
Estimated Population ...	67,448		67,584	

TABLE VIII.

NEW AMSTERDAM.

Chief Causes of Death. Rate per 10,000 population.	1937.		1938.	
	No.	Rate.	No.	Rate.
(1) Respiratory Infections (11, 106-109) ...	19	19·7	36	36·3
(2) Diseases of Early Infancy (158-161) ...	26	26·9	31	32·1
(3) Diseases of Circulatory System (90-103) ...	20	20·7	29	30·0
(4) Malaria, Blackwater and Undefined Fevers (38, 44) ...	11	11·4	25	25·9
(5) Intestinal Infections (13, 119, 120) ...	18	18·7	18	18·6
(6) Old Age (162) ...	12	12·4	12	12·4
(7) All forms of Tuberculosis (23-32) ...	8	8·3	11	11·4
(8) All forms of Nephritis (130-132) ...	8	8·3	11	11·4
(9) Other Causes ...	72	74·6	75	77·6
Total ...	194	201·	248	257·
Estimated Population ...	9,650		9,665	

52. The most significant increases are to be observed in malaria, etc., and respiratory infections, the former of which showed an excess of double the mortality rate of the previous year and the latter somewhat less than that proportion.

53. While the populations and amenities of the two urban communities are by no means comparable and the relative mortality rates are disproportionate, it is of distinct interest to observe the general similarity in importance of the chief causes of deaths, if old age, nephritis and cancer are eliminated from consideration. The disproportionate rates may perhaps be indicative of the advantages of sanitation and social welfare activities enjoyed by Georgetown, but the relative similarity of the array of the chief causes of death must suggest a similarity of the habits, customs and practices of the two population groups that contribute to those deaths which to a considerable extent may be viewed as preventable. This at least tends to confirm the view that amenities alone are not the solution to these causes of death.

54. The following tables give the vital statistics for each registration district in the Colony for the year 1938, and return of vital statistics for Georgetown and New Amsterdam for the years 1938, 1937, 1936 :—

TABLE IX.

NOTE.—The deaths of persons in the Hospitals and other Public Institutions have in each case been returned as occurring in the district from which the patients came.

(1) DISTRICT.	(2) Estimated Population.	(3) Births.	(4) Deaths.	Annual rate per 1,000 living.		(7) Enteric Fever.	(8) Intestinal Disorders over one year.	(9) All Renal Diseases.	(10) All Respiratory Diseases.	(11) Malaria Fever.	(12) Undefined Fevers.	(13) Phthisis and other forms of Tuberculosis.	(14) Intestinal Disorders under one year.	(15) Still-Births.	(16) No. of deaths of children under one year of age.	(17) Deaths of children under one year of age to 1,000 registered births.
				(5) Births.	(6) Deaths.											
Skeldon ...	15,764	544	518	34.5	32.9	...	25	27	29	134	45	7	9	24	131	241
Port Mourant ...	26,296	979	599	37.2	22.8	3	50	34	93	93	3	8	23	40	148	151
Lower Canje ...	10,978	319	323	29.1	29.4	1	38	22	55	43	15	3	13	11	52	163
Upper Canje ...	710	10	8	14.1	11.3	...	1	2	...	...	2	...	...	...	1	100
New Amsterdam ...	9,665	305	265	31.6	27.4	1	16	17	38	22	2	13	5	36	47	154
Highbury ...	2,646	59	104	22.3	39.3	...	8	11	15	11	4	5	...	5	13	220
Mara and Upper Berbice River ...	2,807	74	67	26.4	23.9	...	3	1	6	4	6	1	1	...	10	135
Cotton Tree ...	14,264	489	368	34.3	25.8	2	21	19	70	55	18	4	6	23	74	151
Mahaicony ...	11,816	315	262	26.7	22.2	...	21	13	37	37	15	4	3	17	53	168
Mahalca ...	13,600	427	380	31.4	27.9	3	20	22	43	61	9	9	16	22	85	199
Buxton ...	22,265	639	652	28.7	29.3	9	37	50	123	83	12	12	18	23	134	210
Plaisance ...	23,663	630	650	26.6	27.5	4	48	62	100	77	4	16	16	29	111	176
Georgetown ...	67,534	1,946	1,412	28.8	20.9	10	83	134	172	66	11	87	20	143	232	119
Peter's Hall ...	19,392	533	595	27.5	30.7	2	43	61	93	39	18	22	17	24	107	201
Demerara River ...	8,404	242	171	28.8	20.3	1	12	7	22	2	31	10	3	13	33	136
Belle Vue ...	14,239	402	473	28.2	33.2	2	30	46	67	53	21	29	5	31	74	184
Leonora ...	13,545	395	311	29.2	23.0	13	21	26	42	50	5	6	5	29	63	159
Philadelphia-Leguan ...	14,585	463	458	31.7	31.4	6	29	40	81	65	12	6	11	43	98	212
Up. Essequibo River ...	1,045	3	27	2.9	25.8	...	1	1	4	...	4	1	...	...	1	333
Bartica ...	4,783	112	97	23.4	20.3	...	9	7	13	10	6	7	...	5	8	71
Up. Mazaruni River..	2,105	7	36	3.3	17.1	...	4	...	3	2	3	1	...	...	...	...
Wakenaam ...	4,160	134	106	32.2	25.5	...	9	11	12	5	1	2	5	6	27	201
Suddie ...	8,197	273	265	33.3	32.3	3	14	30	48	29	22	6	2	28	55	202
Anna Regina ...	11,390	298	273	26.2	24.0	1	23	23	25	29	16	5	6	9	53	178
Pomeroon ...	6,113	218	126	35.7	20.6	...	15	13	5	3	38	4	5	2	30	138
North West ...	7,505	200	158	26.6	21.1	...	9	2	38	16	23	9	1	2	21	105
Males ...	163,348	5,131	4,573	30.5	27.2	30	320	339	757	493	164	153	103	314	930	181
Females ...	169,173	4,885	4,131	28.9	24.4	31	275	347	477	496	182	124	92	258	731	150
Persons ...	337,521	10,016	8,704	29.7	25.8	61	595	686	1234	989	346	277	195	572	1,661	166
For Year 1937 ...	337,039	11,227	7,367	33.3	21.9	65	401	630	934	755	327	298	151	655	1,359	121
For Year 1936 ...	332,898	11,736	6,800	35.3	20.4	115	292	589	877	754	277	261	164	645	1,414	120

RETURN OF VITAL STATISTICS FOR GEORGETOWN AND NEW AMSTERDAM FOR THE YEARS,
1938, 1937, 1936.

NOTE.—The deaths of persons in the Hospitals and other Public Institutions have in each case been returned as occurring in the district from which the patients came.

(1) DISTRICT.	(2) Estimated Population.	(3) Births.	(4) Deaths.	Annual rate per 1,000 living.		(7) Enteric Fever.	(8) Intestinal Disorders over 1 year.	(9) All Renal Diseases.	(10) All Respiratory Diseases.	(11) Malaria Fever.	(12) Undefined Fever.	(13) Phthisis and other forms of Tuberculosis.	(14) Intestinal Disorders under 1 year.	(15) Still-Births.	(16) No. of deaths of children under 1 year of age.	(17) Deaths of children under one year of age to 1,000 registered births.
				(5) Births.	(6) Deaths.											
Georgetown, 1938 ...	67,584	1,946	1,412	28·8	20·9	10	83	134	172	66	11	87	20	140	232	119
Georgetown, 1937 ...	67,448	2,108	1,396	31·3	20·7	9	59	123	138	74	12	110	23	148	217	103
Georgetown, 1936 ...	66,601	2,018	1,232	30·3	18·5	39	33	118	135	55	8	79	13	159	222	110
New Amsterdam, 1938	9,665	305	265	31·6	27·4	1	16	17	33	22	2	13	5	36	47	154
New Amsterdam, 1937	9,650	338	210	35·0	21·8	2	17	15	19	9	2	8	4	40	35	104
New Amsterdam, 1936	9,514	313	170	32·9	17·9	1	5	15	14	18	2	6	9	43	35	112

55. Reference is invited to Appendix III for comparison with the statistical and graphic data derived from a study covering the years 1900–1937.

III—PUBLIC HEALTH.

A.—General Remarks.

56. No changes in the administrative aspects of public health have occurred during the year 1938. The Central Board of Health met in regular or extraordinary session on 13 occasions. Under the existing terms of reference the Board have no practical executive functions in the urban sanitary districts (Georgetown and New Amsterdam), both of which under the Town Councils' Ordinances have organised public health departments. In the case of the former, a Medical Officer of Health is employed by the Town Council, who is responsible for the activities of the municipal department and its personnel. In the case of New Amsterdam while there is a small public health department, the post of Health Officer is filled in an honorary capacity by the Assistant Government Medical Officer of Health for the county, or the District Medical Officer. The consequence of this is that no consecutive programme of public health activity is possible and this is restricted to the stereotype inspections of a routine character and the submission of advice to the Council.

57. In the case of organised Village and Country Districts, of which there are 89 actually operating, the authorities of these are *de facto* local sanitary authorities charged with specified public health responsibilities under the Public Health Ordinance, 1934, and the District By-laws, etc. Fifty-five of these are served by sanitary inspectors who are officers of the Government Public Health Department appointed to act as officers of the respective local sanitary authorities. These sanitary inspectors are supervised by the County Sanitary Inspectors who are responsible to the Assistant Government Medical Officer of Health for the respective counties of Berbice, Demerara and Essequibo. Leave, transfer and out-standing vacancies during the past year occasioned a disorganisation which left both Berbice (since May, 1938) and Essequibo without the resident services of a County Health Officer. In consequence of this, the executive responsibilities of these counties are carried on by the acting Government Medical Officer of Health at headquarters who, in addition, is charged with responsibilities for the whole organisation as the Executive Officer of the Central Board of Health. Progress has been thereby handicapped. Government Medical Officers assume practically no public health responsibilities within the aegis of the Central Board of Health. It is therefore patent that some revision of the present organisation is required.

58. In the past, a travelling caravan equipped with an electrical generator has been utilised for the purpose of public health exhibitions. These have consisted in public lantern lectures, the demonstration of various models, cinema films, parasite life cycles and the distribution of discursive pamphlets on various public health subjects. On account of the shortage of executive staff, this feature has not operated over the past 18 months. Experience with the activities of the local sanitary authorities in Village and Country Districts tends to suggest that this phase of Local Government in general is not fully understood or appreciated by many of the members of these Authorities. For that reason it may be that the programme of public health education might be re-oriented with advantage to deal with the problems and solutions of local sanitary administration. Thereafter, when local sanitary authorities are cognisant that the facts of public health are based on established causes and effects, which preclude one man's opinion being as good as another's, then it is possible to believe that the caravan type of public health education for the masses will serve a more valuable purpose. Public meetings of this nature at present offer a spectacular form of entertainment from which it is doubtful that commensurate educational benefit is obtained. In brief, there are grounds for the belief that under the form of Local Government that operates in British Guiana, the health education of the leaders may be more profitable than propagandising the masses.

59. Three voluntary health agencies are active in the Colony—the British Empire Leprosy Relief Association, the Infant Welfare and Maternity League and the British Guiana Society for the Control and Treatment of Tuberculosis. The activities of these agencies require no explanation. While there is a tendency for such agencies not to extend their operations beyond the limits of the groups with which by their designation they are concerned, and while neither leprosy nor tuberculosis is a major factor in the morbidity or mortality experience of the Colony, it is a fact that these diseases and infant mortality are factors which show distinct evidences of reduction in the mortality rates of the Colony. The assignment of a full-time officer to responsibilities connected with the specialised purposes of these organizations in the instance of leprosy was made about 1887, and in the instance of tuberculosis will be made with the opening of the new Tuberculosis Sanatorium. Whether or not a similar appointment would be of advantage to Infant Welfare and Maternity work remains for consideration. Acknowledging the meritorious accomplishments of the voluntary health agencies, it must be pointed out that full recognition does not appear to have been given to the fact that it is not possible to dissociate the wide field of preventive medicine and social welfare from the specific diseases or combinations with which these agencies are concerned. This raises the question of whether health visitors should not be employed more as public or district health nurses in extension of the present sphere of interest, rather than to restrict their activities to the immediate problems arising within specific disease groups.

B.—General Diseases.

60. *Nephritis.*—The total number of deaths was 673 which gave a rate of 1.9 per 1,000 in 1938 compared with an average of 555 deaths and a mean rate of 1.7 during the years 1928–1937. The following table shows the number of in-patients with acute and chronic nephritis together with deaths and case mortality in public hospitals of the Colony for the last ten years :—

Year.	Cases.	Deaths.	Case Mortality.
1929 ...	484	143	29.5%
1930 ...	449	111	24.7%
1931 ...	473	124	26.2%
1932 ...	486	135	27.7%
1933 ...	459	150	32.7%
1934 ...	538	159	29.5%
1935 ...	549	111	20.2%
1936 ..	462	113	24.4%
1937 ...	556	111	19.9%
1938 ...	446	143	32.06%

61. *Respiratory Diseases*.—Pneumonia (lobar and undefined pneumonia) was responsible for 455 deaths throughout the Colony with a rate of 1.3 per 1,000 compared with 385 deaths with a rate of 1.1 per 1,000 in 1937, and 339 and 1.01 in 1936.

62. *Bronchitis and Broncho-Pneumonia*.—Caused 779 deaths which is equivalent to a rate of 2.3 per 1,000. During the previous ten years the number of deaths averaged 590 with a mean rate of 1.8 per 1,000.

63. *Diseases of the Heart*.—There were 460 deaths registered in the Colony from all forms of heart disease (excluding diseases of the arterial, venous and lymphatic systems). 505 cases were treated in public hospitals with 166 deaths.

64. *Bowel Diseases (excluding the Enterics and Dysenteries)*.—The number of deaths registered in 1938 was 568 as compared with 369 in 1937. The average number of deaths during the previous ten years was 413 while the mean rate per 1,000 was 1.2 compared with 1.3 in 1937.

65. *Cancer and other malignant tumours*.—The total number of deaths from cancer in the Colony during 1938 is given by the Registrar-General as 144 as against 147 in 1937. The number of deaths and the death-rate per 1,000 from cancer from 1929 to 1938 are as follow :—

Year.	No. of Deaths.	Rate per 1,000 of Population.
1929	76	.24
1930	89	.23
1931	87	.27
1932	112	.35
1933	86	.26
1934	113	.35
1935	113	.34
1936	110	.33
1937	147	.43
1938	144	.42

66. The average annual number of deaths during this decade was 107 representing a mean annual rate of .33 per 1,000 of the population.

67. 162 cases (new and old) of malignant diseases with 33 deaths were treated in public hospitals.

68. The following table gives the different forms of malignant growths (new cases) recorded in public hospitals together with the racial incidence :—

TABLE X.

	Carcinoma.		Sarcoma.		Epithelioma.		Rodent Ulcer.		Endothelioma.		Unclassified.		TOTAL.	
	1937	1938	1937	1938	1937	1938	1937	1938	1937	1938	1937	1938	1937	1938
European (other than Portuguese)	...	...	...	...	...	...	...	...	...	...	...	...	...	...
European (Portuguese)	2	5	1	...	1	...	1	1	...	...	1	...	...	...
East Indian	20	26	2	1	2	...	...	...	...	...	1	...	6	6
African	53	55	7	9	1	1	...	...	...	...	...	...	25	27
Mixed	11	12	...	2	...	1	...	...	...	...	...	...	61	65
Chinese	...	1	1	...	...	...	...	...	...	...	...	...	11	15
Aboriginal Indian	1	1	...	...	...	...	...	...	...	...	...	...	1	1
	87	100	11	12	4	2	1	1	...	...	2	...	105	115

69. The following table furnishes a comparative statement of diseases treated, with deaths, in Government Hospitals during the years 1934, 1935, 1936, 1937 and 1938 :—

TABLE XI.

	1934.		1935.		1936.		1937.		1938.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Malaria ...	2,364	154	2,535	161	2,359	125	2,169	125	2,458	148
Blackwater Fever ...	10	3	10	3	10	2	8	2	10	4
Dysentery ...	183	32	109	14	73	12	129	23	194	27
Enteric Fever ...	136	41	149	44	314	85	254	42	155	39
Diarrhoea and Enteritis and Colitis ...	460	150	255	39	211	45	407	67	490	114
Filariasis (and Filarial Bubo) ...	244	13	268	19	283	14	281	12	336	14
Heart Disease (all forms) ...	403	145	413	143	417	142	401	132	505	116
Nephritis (including Uraemia) ...	538	159	549	111	462	113	556	111	446	143
Pneumonia ...	136	92	162	100	188	90	246	140	265	135
Broncho-pneumonia ...	92	57	83	49	62	38	73	47	133	70
Bronchitis ...	792	118	753	82	590	66	584	40	766	65
Tuberculosis (including Phthisis) ...	456	135	487	146	480	143	530	197	483	163

70. The deaths registered as due to the same diseases throughout the Colony for the same period are as follows :—

TABLE XII.

	1934.	1935.	1936.	1937.	1938.
Malaria and Undefined Fevers ...	1,203	694	754	755	989—Malaria Fever. 346—Undefined Fevers.
Blackwater Fever...	13	8	7	8	9
Dysentery ...	235	72	60	113	165
Enteric Fever (including Typhoid and Paratyphoid Fevers)...	85	69	115	65	61
Enteritis (including Diarrhoea) ...	595	280	318	369	563
Filariasis (including Filarial Bubo) ...	38	43	65	32	52
Heart Disease (all forms) ...	343	379	379	403	460
Nephritis (including Uraemia) ...	573	539	584	626	673
Pneumonia ...	362	369	339	385	455
Broncho-pneumonia ...	194	222	193	231	300
Bronchitis ...	448	419	345	318	479
Tuberculosis (including Phthisis) ...	253	274	261	298	277

71. The diseases responsible for the highest number of deaths for the whole Colony during the years 1934, 1935, 1936, 1937 and 1938, arranged in quarterly periods, are shown in the following table :—

TABLE XIII.

Diseases.	March Quarter.					June Quarter.					Sept. Quarter.					Decr. Quarter.					Total.				
	1934	1935	1936	1937	1938	1934	1935	1936	1937	1938	1934	1935	1936	1937	1938	1934	1935	1936	1937	1938	1934	1935	1936	1937	1938
Malaria and Undefined Fevers	421	...	...	...	...	257	...	...	...	...	225	...	...	...	...	300	...	...	...	...	1,203	...	...	...	...
Malaria ...	...	191	176	196	190	...	138	169	154	156	...	156	203	171	317	...	209	206	234	326	...	694	754	755	989
Undefined Fevers	...	61	72	74	79	...	58	66	69	68	...	82	81	81	105	...	59	58	103	94	...	260	277	327	346
Pneumonia and Bronchitis	415	247	245	256	259	219	320	227	270	292	201	245	212	232	382	169	198	193	176	301	1,004	1,010	877	934	1,234
Kidney Diseases	186	157	157	181	183	137	141	137	148	184	120	125	144	149	166	142	127	151	152	153	585	550	538	630	686
Diseases of early Infancy (including Premature Birth, Infantile Debility, etc.)	302	207	166	162	219	143	120	134	115	138	106	116	162	188	171	165	164	169	175	204	716	607	631	640	732
Bowel complaints (including Dysentery, Diarrhoea, Enteritis, etc.)	399	121	110	146	212	261	98	110	109	203	120	108	107	107	175	134	90	129	190	260	914	417	466	552	790
Phthisis and other forms of Tuberculosis	68	79	59	68	71	75	75	58	79	58	48	61	70	92	84	62	59	74	59	64	253	274	261	298	277
Diseases of the Circulatory System	128	116	123	138	129	118	93	102	108	121	84	131	122	128	154	95	100	105	107	122	425	445	452	481	526
Diseases of the Nervous and Sense Organs	123	98	105	77	128	107	93	79	119	103	85	80	81	89	111	97	98	93	100	114	412	369	358	385	456

72. The Director of Agriculture has kindly supplied the following information regarding the quarterly rainfall at the Botanic Gardens, Georgetown :—

	1934.	1935.	1936.	1937.	1938.
1st Quarter	33.90	20.35	18.01	13.62	42.20
2nd Quarter	14.83	27.08	40.36	35.67	32.29
3rd Quarter	15.31	27.29	13.47	26.01	29.55
4th Quarter	17.00	11.63	32.25	16.86	14.96
Total	81.04	86.35	104.09	92.16	119.00

C.—Communicable Diseases.

73. A survey of the records of the notifiable diseases has been undertaken to obtain some idea of the recorded prevalence of the various diseases and their seasonal incidence. The average monthly number of notified cases of such of these diseases as have significant incidence is submitted for comparison with the cases notified in 1938. The enteric fevers have been notifiable since 1916, diphtheria and chicken-pox since 1921. These diseases apart from tuberculosis which has been a notifiable disease since 1915 provide the only data of interest.

74. *Malaria—General.*—The importance of this disease as a cause of death is borne out by the section on Vital Statistics. The number of admissions to the combined public hospitals indicates that malaria is the cause for which more than 10% of all in-patients are admitted. To what extent the case fatality rate experienced in hospitals may permit the estimation of morbidity from this disease is doubtful, but it would appear possible that there may have been approximately eight times as many equally severe cases of the disease treated outside the public hospitals, and an undeterminable number of less severe cases.

75. Of the 2,468 cases diagnosed in hospital, 10 cases of blackwater fever are included, only 14.7% were classified as to parasite species: of these (348) 62% were benign tertian, 37% malignant tertian and approximately 1% were quartan. Under the circumstances noted no further emphasis is necessary to indicate the need for an extension of effort directed both to research and control of this disease.

76. *Epidemic.*—Malaria was reported in epidemic proportions from the settlements in Tiger Creek and Crabwood Creek on the left bank of the Corentyne River in June, a supernumerary dispenser was employed under the direction of the Government Medical Officer of the district. By August this epidemic extended westwards as far as New Amsterdam and across the Berbice River to the Bath Estate.

77. To meet this contingency an additional temporary staff of four dispensers was employed. These men were posted to selected centres on the public road under the direction of the Government Medical Officer in the respective districts where the affected population, not eligible for treatment by estate hospitals, reside. Liquid quinine was administered twice daily, without charge, from these centres and sub-centres to all persons who attended. Conspicuous posters were affixed in public places served by the various centres, stating the place and time of attendances and the purposes to be served. Dispensers were instructed to restrict their services to this disease, not to issue bottled supplies of the drug and, except in special emergencies, to refrain from home visitations. Identification cards with counterfoils were supplied to ensure regularity of attendance and that each adult attending received at least 20 grs. of quinine daily for eight successive days. The volume of attendances was such that this control system failed to be strictly observed, but the regimen was stated to be surprisingly observed. The dispensers were withdrawn in mid-October when a general abatement of the epidemic was to be observed. In all 308,000 grs. of quinine sulphate were distributed free by dispensers in the course of this mass treatment campaign.

78. A complicating factor in this outbreak was a sharp epidemic of influenza to be noted elsewhere which appeared in the Colony during the last week in August, continuing until the third week in October. It is not possible to clearly dissociate the incidence of these two diseases in Berbice where the reported epidemic incidence of influenza occurred in the first week of September and disappeared in the second week of October, and, from the numbers involved, was decidedly less general than in the rest of the Colony. One cannot fail to believe that some overlapping must have occurred with a preferential bias directed to the diagnosis of malaria in the area under discussion, or, less likely, that the converse applied elsewhere in the Colony.

79. Corroborative evidence from the malarial admissions to the three estate hospitals concerned on the Corentyne Coast shows the experience of these institu-

tions where resident observation doubtless afforded the opportunity for confirming diagnosis.

— 80. Study of the vital indices over the previous decade indicates that the County of Berbice is probably the most salubrious section of the coastlands, and from enquiry into the indices of the various Registration Districts in that county, it would appear that over the same period the salubrity of the county owes its distinction chiefly to conditions that obtain in the districts in which the estates Skeldon, Port Mourant, and Albion are located. Abnormal rainfall occurred throughout 1937 and 1938 with the results depicted in the accompanying chart referable to Table XVI.

81. The relative importance from a malariological aspect of the three estates (see Graph II and Table XVI) probably is illustrative of similar conditions obtaining in the inhabited countryside from which no morbidity data have previously been recorded. The conditions indicated for 1936 and the first half of 1937 may be considered as the normal experience. Thereafter it is evident that these areas experienced a double epidemic wave of which that commencing in May, 1938, was the more severe.

82. Enquiries undertaken by Dr. G. Giglioli, the Medical and Sanitary Advisor to the Sugar Producers Association, indicate for 1938 that there was an unusual and predominating prevalence of *A. darlingi* associated with this outbreak, notably in the Crabwood Creek area which is intensively used for rice cultivation and is contiguous with Plantation Skeldon. Heretofore it has been assumed with a certain amount of supporting evidence that rice fields in Berbice and Demerara for various reasons associated with the major vector's habits are not generally responsible for malaria. As a result of the abnormal precipitation with consequent flooding from the backlands, conditions in the rice fields were so altered as to meet the selective requirements of *A. darlingi*. Ordinarily, rice fields in Berbice have attractiveness to *A. tarsimaculatus* which Giglioli believes to be essentially *zoophilous* in its habits and not a vector of any significance.

83. Giglioli's comprehensive investigations at Plantation Skeldon in October, 1937, showed a splenic index of 2% and a plasmodial index of approximately 21%, bearing out the apparent recency of the epidemic conditions then in evidence. In August, 1938, the same investigator reported the species prevalence of plasmodia from blood films on 24 hospital patients as follows: 13 showed *P. falciparum* and 5 *P. vivax*.

84. The Government Medical Officer responsible for Plantation Port Mourant and Plantation Albion (Dr. L. R. Sharples), has submitted the following tabulated data which gives some idea of the conditions observed at these estate hospitals during the year under review.

TABLE XIV.
BLOOD FILM EXAMINATION, 1938.

Estate.	Total films examined. No.	Plasmodial distribution.							
		Falciparum.		Vivax.		Mixed.		Total.	
		No.	%	No.	%	No.	%	No.	%
Port Mourant	176	28	15.8	52	29.6	3	7.0	93	52.9
Albion	Nil.	...	...	...	...	...	...	...	...

(No *P. Maariae* found).

TABLE XV.—MALARIA.

ESTATE HOSPITAL ADMISSIONS. AGE DISTRIBUTION. CASES AND DEATHS.

Age Groups.	Port Mourant.				Albion.			
	Cases.		Deaths.		Cases.		Deaths.	
	No.	%	No.	Fatality rate.	No.	%	No.	Fatality rate.
Under 1 ...	6	0·96	1	16·7	64	3·48	6	9·3
1-4 ...	44	6·57	2	4·5	250	13·6	9	3·6
5-9 ...	64	9·55	...	...	263	14·35	3	1·1
10-14 ...	84	11·95	1	0·2	207	11·25	1	0·48
15-19 ...	89	13·29	...	...	156	8·46	1	0·64
20-29 ...	127	18·95	...	...	295	16·05	1	0·34
30-39 ...	136	20·30	...	...	221	12·0	1	0·45
40-49 ...	70	10·45	...	...	188	10·2	...	...
50-59 ...	35	5·22	...	...	146	7·9	1	0·68
60+ ...	15	2·24	...	...	52	0·28	1	1·92
Total ...	670	100	4	0·59	1,842	100	24	1·29

85. It is not proposed to attempt any deductions from Table XV other than to draw attention to the fact that the populations concerned are within comparable limits and to note that while both estates are situated to the windward of cane cultivation and both have enjoyed a favourable reputation as not being particularly malarious, the residential section of Plantation Port Mourant is surrounded on all but its northern front by extensive rice cultivation, and the residential section of Plantation Albion has a similar potential source of anophelines on its whole northern front, the prevailing wind being north-easterly. The Department is without substantial evidence of the species distribution or the major sources of anophelines, but general impressions of possibilities would weight the chances as indicated by the respective hospital admissions. We are not prepared to do more than suggest that the relative age distribution of admissions may indicate that the older age groups of Port Mourant have had less experience with malaria and in consequence were less tolerant than those of the same age groups at Albion. Until malaria has been the subject of more extensive and concerted investigation in this Colony, correlations of this nature are of excusable value only for record purposes.

86. Analysis of the admissions of residents of New Amsterdam over 18 months indicates that an abnormal increase in admissions from this disease was to be observed from June until August of the year under review, although this accession was by no means proportional to the estates' experience. It may also be noted that the residents of Plantation Bath on the western side of the Berbice estuary, who hitherto are reported to have enjoyed a peculiar freedom from malaria, were afflicted with this disease in epidemic proportions commencing about September.

87. The foregoing offers evidence of the occurrence of epidemic malaria in the County of Berbice which appears to have had its origin at the easterly border of the Colony as a sequel to unusually heavy and protracted rainfall. This epidemic extended over the whole of the coastal portion of the County of Berbice. It is not possible to offer substantial evidence that the therapeutic control measures undertaken during the second phase of the epidemic were contributory to the decline. The abrupt decline at Skeldon where a similar system of treatment was introduced in the first instance in conjunction with extensive clearing operations is suggestive, but under the circumstances related not convincing.

88. Although quinine has been available at cost price through the post offices since 1906 and considerable quantities are sold annually, familiarity with this source of the drug appears to have bred a contempt for its value in the form dispensed by that means. The question must obviously arise whether the persons receiving 160 gr. of liquid quinine over eight consecutive days would not have reacted similarly to the same dosage of the drug as purchased from the post office. Of this we have no evidence but the chances are that the results would have been identical.

The belief that "Government Quinine" is not effective has common acceptance but this is more probably to be explained by the fact that self-administered quinine is taken in inadequate dosage and is stopped with the earliest relief of symptoms, whereby relapses are inevitable and the reputation of the cheap drug suffers.

89. Attention is directed to Appendix II of this report in which will be found a comprehensive survey of the available scientific data regarding the anopheline mosquitoes of the Colony by Dr. G. Giglioli, Medical Advisor to the Sugar Estates of British Guiana.

TABLE XVI.

ESTATE HOSPITALS—MALARIA—MONTHLY ADMISSIONS.

Year and month.				Skeldon.		Port Mourant.		Albion.	
				No.	Annual %.	No.	Annual %.	No.	Annual %.
1936									
August	...	...	...	7		34		34	
September	...	...	...	18		26		46	
October	...	...	...	9		20		38	
November	...	...	...	11		33		57	
December	...	...	...	8		23		48	
Total	...	...	...	53		136		223	
1937									
January	...	...	...	5	0.7	42	12.4	76	9.2
February	...	...	...	13	1.8	34	10.0	51	6.2
March	...	...	...	22	3.0	16	4.9	45	5.5
April	...	...	...	9	1.2	9	2.7	24	2.9
May	...	...	...	5	0.7	8	2.4	28	3.4
June	...	...	...	23	3.1	15	4.4	12	1.5
July	...	...	...	23	3.1	13	3.8	34	4.1
August	...	...	...	59	8.0	16	4.9	25	3.0
September	...	...	...	155	21.2	27	8.0	41	5.0
October	...	...	...	114	15.5	43	12.7	84	10.4
November	...	...	...	179	24.4	56	16.5	189	22.9
December	...	...	...	125	17.1	60	17.7	215	26.1
Total	...	...	...	732	100.	339	100.	824	100.
1938									
January	...	...	...	159	8.2	50	7.4	192	10.4
February	...	...	...	136	7.0	38	5.7	116	6.3
March	...	...	...	135	7.0	25	3.7	63	3.4
April	...	...	...	106	5.5	20	3.0	51	2.8
May	...	...	...	194	10.0	20	3.0	86	4.7
June	...	...	...	284	14.7	33	4.9	150	8.1
July	...	...	...	281	14.6	36	5.4	210	11.4
August	...	...	...	357	18.5	42	6.3	225	12.2
September	...	...	...	114	5.9	101	15.0	250	13.6
October	...	...	...	60	3.1	106	15.8	183	9.9
November	...	...	...	67	3.5	111	16.6	188	10.2
December	...	...	...	42	2.2	88	13.1	128	7.0
Total	...	...	...	1,926	100.	670	100.	1,842	100.

GRAPH II.

ADMISSIONS ON ESTATE HOSPITALS

CORENTYNE COAST, BERBICE

MALARIA



90. *Influenza*.—Influenza is not a notifiable disease in consequence of which the only accurate information available to the Department arises from the weekly routine reports from public hospitals, Government Medical Officers and Government dispensers. The normal weekly reports show a weekly incidence of influenza varying between 4—46 cases. An abrupt epidemic incidence was first noted the week of August 27th with 216 reported cases, reaching the peak of 961 cases by September 10th declining less precipitously to a level of 18 cases. The epidemic ceased by the week of October 22nd. Over this period of 8 weeks, 3,822 cases were reported with 38 deaths—a case fatality rate of approximately 1 per cent. Comparing the total year's experience reported from this source with the total number of deaths reported by the Registrar-General it would appear probable that there may have been a total of about 7,300 cases of influenza during this epidemic. From such information as was available, the epidemic would appear to have spread rapidly to the interior amongst the Aboriginal Indians. The source of the epidemic is not known. The early appearance of this epidemic in the Port of Georgetown suggests the probability of its introduction through maritime sources.

91. A less imposing increase in the incidence of the pneumonias was reported about the same time through the same sources as noted above, commencing about a fortnight later and reverting to the normal level after four weeks duration.

92. *Tuberculosis*.—Amongst the notifiable diseases in this Colony tuberculosis accounts for the greatest number of deaths. Popular interpretation of this fact has tended to give the impression that tuberculosis is the first cause of death. Since

1900 there has been a steady decline in the mortality rate from this disease. With 277 deaths recorded from that cause in 1938, the mortality rate of 8.2 per 10,000 population and the declining trend suggest that the residents of the Colony may be benefiting from the self-limiting effects of long exposure to infection which has been observed elsewhere. There is no question that the notification of cases is disproportionately small and varies widely with the interested concern of the medical profession and the Society for the Treatment and Control of Tuberculosis in British Guiana. Analysis of the sex and age distribution of notified cases since 1915 indicates an experience wherein an increasing proportion of males is being notified. Furthermore, in the first decennium 1915-24, the notifications for tuberculosis of persons over 40 years of age represented 29.5 per cent. of all such notifications. In the period 1925-37, this age group accounted for 35.4 per cent. of the notifications. The corresponding proportions in the age group 20-29 wherein experience elsewhere gives reason to expect that tuberculosis may be more liable to have recognition is 32.1 per cent. and 27.5 per cent. One cannot fail to record the suspicion that in the older age groups many cases of chronic asthma and bronchiectasis may have been notified as tuberculosis without the benefit of bacteriological and radiological confirmation which for many years have been considered essential criteria. While it is by no means certain that this standard of diagnosis is now applied to all notified cases, some degree of improvement may be inferred from the position shown during 1938 as compared with the quinnennium 1933-37.

TABLE XVII.
AGE DISTRIBUTION OF NOTIFIED CASES.

Age Groups.	1933-1937		1938	
	No.	Rate per cent.	No.	Rate per cent.
Under 1	19	0.9	—	—
1 — 4	39	1.9	3	0.9
5 — 9	38	1.9	2	0.6
10 — 14	59	2.9	9	2.7
15 — 19	139	6.9	26	8.2
20 — 29	555	27.8	104	32.7
30 — 39	506	25.3	83	26.1
40 — 49	332	16.6	43	13.1
50 +	316	15.8	48	15.1
Total	2,003	100	318	100

GRAPH III.

Tuberculosis.—AGE DISTRIBUTION OF NOTIFIED CASES



93. Should the commonly accepted factor of relationship between cases and deaths (10:1) be applicable to this Colony, the indication would be that there are approximately 3,000 cases of active tuberculosis, nearly 1 per cent. of the population. Acknowledging the possible diagnostic deficiencies, improvement in which may be anticipated, the major problem is to be met in the attitude of the public towards the disease. In general, the diagnosis of tuberculosis is considered to attach a social stigma to the patient as well as his family. The signs and symptoms are not unknown but all the proprietary and other panaceas are exhaustively employed before medical advice is sought. Hospital treatment for tuberculosis has general acceptance *in extremis*, and consequently often offers little but comfortable conditions under which to die. Coercive measures are possible under existing legislation, but it is believed that the sensibilities of the public to the employment of such measures would be conducive to even greater concealment of the disease than now occurs. Arrested cases are probably the most happy advertisement of the effectiveness of the sanatorium facilities now available, but until wisdom may be born of such knowledge, and the idea dispelled that "the cure" may be found in a bottle it is indeed fortunate that there appears to be a natural decline in the mortality. In the meantime many individuals will die of a curable disease.

94. *Enteric Group*.—The enterics were reported in epidemic proportions last in 1936 with 512 reported cases and 115 deaths. In 1937 there were 329 reported cases and 65 deaths, showing a fatality rate of 19.8 per cent. compared with 292 reported cases and 61 deaths, showing a fatality rate of 20.9 per cent in 1938.

95. Typhoid and the paratyphoid fevers in this Colony may be considered as one of acute endemic communicable diseases of childhood. In the quinquennium 1933-37, 66 per cent. of the reported cases occurred in the age groups under 14, of which the age group, 5—9, contributed approximately 31 per cent. of the total. During 1938 the respective proportions were 64 per cent. and 35 per cent. Previous experience indicates that an increased prevalence is to be noted in June and in the months of November and December, the two last of which have the greater importance. A greater seasonal dispersion of cases was to be observed in 1938 with a predominating incidence in the month of January.

96. The endemicity of these enteric infections is such that widespread epidemics are not likely to be met. Bacteriological methods in diagnosis are not sufficiently called upon outside hospital practice in consequence of which it must be acknowledged that many mild or atypical cases cannot fail to be overlooked. The proportionate incidence of typhoid and the para-typhoids not being clear, and the case fatality rates based upon reported cases being out of proportion to general experience for purposes of calculation, 7 per cent. is assumed to be a representative case fatality rate for the enterics as a whole. Under such circumstances it is estimated that for every four cases of these diseases only one was notified. It is possible that there were about 900 cases in 1938.

97. *Chickenpox*.—Chickenpox appears to have a comparatively regular seasonal incidence, and, during 1938, followed a similar course to that experienced in the previous quinquennium.

98. *Diphtheria*.—Although the number of notified cases of diphtheria is not large, the high fatality rate suggests that the early diagnosis or treatment of cases, or both factors combined, is questionable. Analysis of these returns shows that of the 31 cases notified, 15 occurred in Georgetown of which 5 cases were fatal (fatality rate of 33%). Seven of these cases were reported from the public hospital and of the eight other cases reported, five physicians were concerned. The explanation of this situation is difficult to find since diagnostic facilities are readily available in Georgetown and possible through the post from elsewhere. Assuming that the deaths from this cause represent the usual experience with cases receiving adequate treatment with antitoxin (7 per cent case fatality rate) it may be justifiable to estimate that there were 3 to 4 times more cases than were notified in 1938.

99. Experience from 545 cases reported over the years 1921-37 shows that 57% of these cases occurred in the age group 1-9 years, 32.6 per cent. of the total occurring in the group 1-4 years. In 1938, 77 per cent. of the total reported cases were in the age group 1-9, and 48 per cent. in the group 1-4 years.

100. It is not possible to know the true importance of diphtheria in this Colony without some enquiry into the immunity status of the community. One hesitates to introduce new problems before the old problems are within sight of solution. The fallacious idea that diphtheria does not occur in the tropics has been amply dispelled by serological studies. If it may be established that diphtheria in this Colony has less lethal significance than in the temperate zone, the notified cases must represent an even smaller proportion of those that did occur than have been calculated here. On the other hand, since it is evident that cases are either not being seen or recognised, it is possible that some of the deaths from less specific causes might have this disease as a cause. It is not feasible at this stage to advocate active immunization against diphtheria in the public health programme apart from a school medical service. It is justifiable, however, to believe that diphtheria is of greater importance than the number of reported cases would indicate. With ample diagnostic facilities available it is inexcusable that a question of missed cases should arise within the range of medical attendance, and, with the merits of the harmless diphtheria antigens so thoroughly established elsewhere, it is not possible to view a single death other than as a preventable catastrophe and so reprehensible.

101. The accompanying graphic records show the relative comparison of the average monthly incidence over the previous quinquennium and the incidence of the three diseases in 1938 ;

GRAPH IV.
ENDEMIC INDEX.
Notifiable Diseases.
(Bar—1933-37 Average : Line—1938).

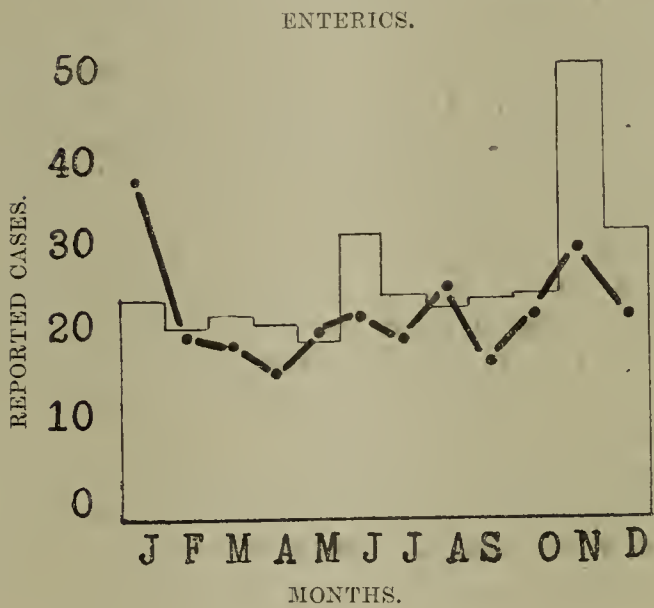


TABLE XVIII.

MONTHLY NOTIFICATIONS—ENDEMIC INDEX.

Months.		Enteric Fever.		Chickenpox.		Diphtheria.	
		1933-1937 Average No.	1938 No.	1933-1937 Average No.	1938 No.	1933-1937 Average No.	1938 No.
January	...	26	40	2	4	3	...
February	...	23	22	4	3	3	1
March	...	24	21	4	2	2	2
April	...	23	17	6	6	1	...
May	...	22	22	15	13	1	1
June	...	34	24	7	3	2	1
July	...	26	21	4	1	2	4
August	...	25	27	11	11	4	3
September	...	25	19	4	1	3	3
October	...	26	24	5	1	3	4
November	...	53	31	4	4	4	6
December	...	35	24	3	4	3	6
Total	...	342	292	69	53	31	31
Deaths	{ No.	80	61	...	...	7	8
	{ %	23.6	20.9	...	...	22.6	25.8

102. *Yellow Fever*.—The last case of yellow fever was reported from Suddie in 1909. Since that time no suspicions of the epidemic form of this disease have been recorded. Reports by lay observers of the possible occurrence of the jungle form of this disease in the Rupununi District occasioned the despatch of a medical mission by air to the suspected area in the latter part of March. Upon the information then available investigation was directed to the inhabited area on the north and north-western foothills of the Kanaku Mountains to the east of the Takatu River. No clinical cases were found. A small representative sampling of blood was obtained from the local residents. Through the generous assistance of the Rockefeller Foundation at Rio de Janeiro, it was shown that of the 46 blood specimens submitted, 13 per cent. were immune to yellow fever. From this limited number, the residential and family dispersion of immunes was such as to suggest that the source of infection was not localized. The fewness of immunes prevented any deductions as to the recency of infection. A full report of this ten-day investigation was submitted to Government covering the specific purpose, and such other medical and epidemiological information as could be obtained. Under these circumstances it was concluded that this area and probably the whole Rupununi District was open to suspicion as a possible source of jungle yellow fever, from which it would be possible that the aedes-infested, more thickly populated coastal belt of the Colony could be exposed to the introduction of the sylvatic virus. The epidemic potentialities of this situation being realised, precautionary control of all downward traffic by boat and cattle-trail was introduced at Kurupukari, through which station, for natural reasons, all such traffic was compelled to pass. Wireless communications being possible, reports on all persons passing through the station *en route* to the coast were notified to Medical Headquarters and their arrival checked in Georgetown. Inspection of such persons was there undertaken and blood sampling from these, representative of a much wider area, provided the means of extending the investigation on the specific immunity status of the inhabitants of the district and other parts of the hinterland.

103. Shortly after the return of the mission to Georgetown, three deaths occurred amongst a party of Aboriginal Indians (and a doubtful contact) who had recently passed through or arrived in Georgetown from the Rupununi. Except for the brevity of the fatal illnesses there were no clinical or *post mortem* evidences of yellow fever. It was considered desirable, however, to submit liver specimens to Rio de Janeiro, and to remove the party from Georgetown to precautionary quarantine. Subsequent reports on the liver specimens failed to confirm the suspicions and no significant illness occurred amongst the contacts.

104. Through the further generosity of the Rockefeller Foundation from March onwards small supplies of their attenuated virus vaccine were made available, and immunization facilities were afforded to such volunteers as could be persuaded to present themselves, especially persons who were proceeding to the interior. By the end of the year 84 persons had submitted to immunization for which departmental certificates were issued. For purposes of recording the prompt concern shown for the implications of this situation it should be noted that a medical representative of the Pan-American Sanitary Bureau arrived from Panama on April 22nd to provide immunization facilities for the resident personnel of the Pan-American Airways Company.

105. In addition to the original group, 225 blood samples were subjected to the immunity test for yellow fever by the Rockefeller Laboratories, of which 116 (51 per cent.) proved to be immune.

106. Arising from the position here reported, the Colony was favoured with a visit of enquiry by Dr. F. L. Soper, the representative of the Rockefeller Foundation in South America, at the end of the year.

107. *Anthrax*.—Epizootic Anthrax was reported from a small section of the Corentyne Coast in the County of Berbice. The affected areas were declared under the Animal Diseases Ordinance by the Governor in Council. By concurrent action on behalf of the Central Board of Health, the restrictive sections of the Public Health Ordinance, 1934, were brought into operation with particular reference to the sale of milk derived from the infected area. These restrictions were operative from July 20th to August 25th. While no human cases were reported, experience indicated the disadvantages of dual responsibilities and authority in the control of a disease which has its chief epidemiological importance in animals other than man.

108. *Acute Anterior Poliomyelitis*.—This became notifiable in 1933. Two cases were reported in 1934; no cases in 1935 or 1936; 56 cases were reported in 1937 and 6 cases in 1938. One case was notified from Georgetown, three from scattered points in Demerara, and one each from Berbice and Essequibo.

109. *Puerperal Fever*.—This condition was first notified in 1935 when 44 cases were reported. Thirty-five cases were reported in 1936, 37 in 1937, and 19 in 1938. With 13 deaths recorded from puerperal sepsis for 1938, it is quite obvious that the reporting of cases of puerperal fever is being ignored.

110. With approximately 700 midwives registered, the insignificant number of cases reported permits no other possible conclusion than that there is a gross failure of this licensed group in their statutory duty. Until qualified midwives as a body can be depended upon to exhibit a sense of responsibility commensurate with the important function which they should perform in the community, the value of their training must be viewed with serious doubt.

111. *Smallpox*.—In view of consular reports from Venezuela in March, indicating the epidemic prevalence of alastrim, quarantine precautions were instituted and preparations made in the North-West District for the possible spread of this disease eastwards into the Colony. These restrictions and precautionary measures were withdrawn the middle of June. No cases of smallpox or alastrim were reported from the areas directly exposed.

112. A doubtful case of alastrim was reported from Bartica on June 22nd, in a male school teacher aged 38, resident in Bartica and successfully vaccinated in 1905. The individual was immediately isolated and an officer of the Health Department sent to make epidemiological enquiries. Upon the evidence obtained it was decided that this was not smallpox. No further cases developed.

113. *Vaccination*.—Vaccination appears to be a perfunctory operation in this Colony. All Government Medical Officers appointed to Districts are public vaccin-

ators in the respective districts and charged with duties under the Vaccination Ordinance.

114. Six other vaccinators are appointed for Georgetown and one for the bauxite workings at Mackenzie, Demerara River.

115. Upon the registration of a birth, registrars are charged with the responsibility of notifying parents of their statutory obligations and the provisions made for carrying out those obligations. In general, therefore, vaccinations usually have a proportionate relationship to births. Port Health Authorities are responsible for ensuring that arrivals from infected ports give evidence of vaccination or submit to same.

116. As elsewhere, the absence of epidemic smallpox in any form tends to discount the merit of this specific prophylactic measure. The number of vaccinations must therefore be chiefly indicative of the public vaccinator's concern with the practice of preventive medicine.

117. The following table shows the number of vaccinations performed :—

TABLE XIX.

	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.
Total Vaccinations ...	6,500	4,864	5,179	6,200	4,880	6,045	34,534	8,325	6,295	8,243
Total verified successful ...	5,824	4,777	4,778	5,834	4,636	5,691	32,006	8,002	5,541	6,616
Per cent. verified successful ...	89.6	98.2	92.3	94.0	95.0	94.1	92.7	96.1	86.6	80.3

118. *Trachoma*.—This disease has been notifiable since 1935, during which year a total of 7 cases were reported. The number of cases reported in the subsequent years was as follows :—1936—28 cases, 1937—9 cases, 1938—10 cases.

119. *Leptospirosis*.—The absence of cases of leptospirosis icterohæmorrhagica from the medical reports of this Colony probably has no other explanation than failure to recognise the clinical syndrome, or to pursue the necessary laboratory diagnosis. Epidemiologically, conditions are favourable for the existence of the disease. Although unspecified jaundice has comparatively minor recorded incidence, the prevalence of unspecified fevers, diarrhœa and enteritis, and nephritis cannot fail to arouse the suspicion that a proportion of these recorded conditions may have a leptospiral ætiology.

120. *Tetanus*.—35 cases were treated in public hospitals with 17 deaths, compared with 31 cases and 13 deaths in 1937.

121. *Yaws*.—17 cases were treated in public hospitals compared with 11 cases in 1937. There were no deaths. 30 cases were treated in the out-patient departments as against 22 in 1937.

122. *Ancylostomiasis*.—115 cases were treated in public hospitals with 5 deaths compared with 83 cases and 2 deaths in 1937. 138 cases were treated in out-patient departments as against 80 in 1937. The deaths registered as due to the same disease throughout the Colony were 10 compared with 4 in 1937.

123. *Venereal Diseases*.—The following table gives the number of venereal diseases treated as in-patients in public hospitals for the last ten years :—

TABLE XX.

	SYPHILIS.					Soft Chancre.	Gonorrhœa and its Com- plications.	Granuloma Venereum.
	Primary.	Secondary.	Tertiary.	Hereditary.	Stage not Indicated.			
1929	228	31	352	67	9	120	616	130
1930	271	44	471	37	31	38	626	111
1931	214	121	782	128	68	12	526	57
1932	75	46	651	89	12	38	647	71
1933	159	51	604	107	7	60	645	63
1934	96	36	664	62	3	46	696	88
1935	130	16	433	41	2	38	657	69
1936	66	17	460	46	...	47	624	69
1937	67	22	429	41	...	59	646	85
1938	83	18	388	50	...	45	678	106

124. The number of Novarsenobillon and other injections given for syphilis at the public hospitals was 24,769 compared with 26,721 in 1937.

125. The table below furnishes a statement classified in age-incidence periods, of in-patients treated for venereal diseases in public hospitals during the year 1938 :—

TABLE XXI.
PUBLIC HOSPITALS.*

Age.	(a) SYPHILIS.												(b) Acute Gonorrhœa.			Chronic Gonorrhœa.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho- Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.			
Under 1 year ...	...	...	...	...	...	...	...	...	...	3	7	10	9	6	15	...	...	...	...	...	...	...	...	...	...
1 to under 5 y s.	...	...	...	...	...	...	...	...	...	6	7	13	2	7	9	...	...	...	...	...	...	...	...	...	...
5 " 10 ...	...	...	...	...	...	...	...	...	...	2	2	4	1	4	5	...	...	...	...	...	...	...	...	...	...
10 " 20 ...	4	2	6	1	3	4	6	27	33	9	9	18	28	30	58	6	18	24	4	2	6	7	5	12	1	...	1
20 " 30 ...	50	4	54	5	3	8	61	74	135	2	3	5	199	40	239	66	57	123	14	3	17	18	26	44	8	4	12
30 " 40 ...	12	...	12	...	...	...	77	53	130	3	...	3	97	16	113	78	29	107	8	...	8	16	9	25	3	1	4
40 " 60 ...	12	...	12	...	...	...	113	38	151	...	...	...	50	6	56	80	11	91	12	...	12	11	9	20	...	1	1
60 years and over	...	...	...	...	...	...	23	6	34	...	...	...	6	...	6	19	2	21	...	...	...	3	4	7	...	1	1
Total ...	78	6	84	6	6	12	285	198	483	25	28	53	392	109	501	249	117	366	38	5	43	55	53	108	12	7	19

* NOTE.—The totals in this table differ from those in the table above in that cases of double infection are here included.

126. The tables below furnish statements, classified in age-incidence periods, of out-patients (new cases) treated at public hospitals, Government dispensaries, and prisons during the year 1938 :—

TABLE XXII.
PUBLIC HOSPITALS.

Age.	(a) SYPHILIS.												(b) Acute Gonorrhoea.			Chronic Gonorrhoea.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho- Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.			
Under 1 year	...	...	...	...	...	...	...	...	...	1	...	2	4	4	1	...	...	...	...	...	...	...	...	...	...
1 to under 5	...	...	...	...	...	...	...	1	...	1	...	2	1	3	1	4	5	...	...	...	...	...	...	...	...
5 " 10	...	...	...	...	...	...	...	1	...	1	...	6	6	4	1	5	...	...	...	...	...	...	...	...	...
10 " 20	9	8	17	...	3	3	13	40	53	20	15	35	98	25	123	6	3	9	1	2	3	3	1	4	...		
20 " 30	50	4	54	19	4	23	88	168	256	1	2	3	386	57	443	78	23	101	15	1	16	18	6	24	...		
30 " 40	27	...	27	9	2	11	101	126	227	...	...	...	170	41	211	82	8	90	6	1	7	5	2	7	...
40 " 60	13	...	13	4	1	5	92	51	143	...	...	...	145	46	191	36	3	39	4	...	4	2	2	4	...
60 years and over	1	...	1	...	...	...	...	...	...	...	...	...	15	26	41	5	...	5	...	...	...	1	1	2	...
Total	100	12	112	32	10	42	296	385	681	23	28	51	820	200	1020	207	37	244	26	4	30	29	12	41	...		

TABLE XXIII.
GOVERNMENT DISPENSARIES.

Age.	(a) SYPHILIS.												(b) Acute Gonorrhoea.			Chronic Gonorrhoea.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho- Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Under 1 year ...	...	...	...	...	...	...	...	...	...	2	2	...	1	4	5	...	...	...	...	...	...	...	...	...	...	...	...
to under 5 yrs. ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" 10 ...	...	1	1	...	...	...	1	...	1	...	...	...	5	2	7	...	...	...	...	...	...	...	...	...	...	...	...
" 20 ...	2	1	3	...	...	...	3	...	3	1	...	1	18	6	24	...	...	...	...	...	...	...	...	...	...	...	...
" 30 ...	12	...	12	...	...	...	10	5	15	...	...	...	105	14	119	23	6	29	5	...	5	1	1	2	...	...	...
" 40 ...	5	2	7	...	...	...	12	4	16	...	...	...	72	14	86	29	5	34	4	...	4	1	...	1	...	...	...
" 60 ...	8	...	8	1	...	...	5	8	13	...	...	...	29	9	38	13	1	14	1	...	1	...	1	...	...	...	...
years and over ...	2	...	2	...	...	...	2	...	2	...	...	...	5	...	5	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	29	4	33	1	...	1	33	17	50	1	2	3	235	49	284	65	12	77	10	...	10	3	1	4	...	...	...

TABLE XXIV.
GEORGETOWN AND NEW AMSTERDAM PRISONS.

Age.	(a) SYPHILIS.												(b) Acute Gonorrhoea.			Chronic Gonorrhoea.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho- Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Under 1 year
to under 5
" 10
" 20	1	...	1	...	...	1	...	...	...	...	...	4	...	4	...	...	5	...	5	...	1	...	1	...	...	...
" 30	5	...	5	10	...	10	...	...	...	...	...	15	...	15	13	...	13	4	...	4	3	...	3	...	...	...
" 40	2	...	2	1	...	1	...	1	...	...	...	4	...	4	12	...	12	1	...	1	2	...	2	...	...	...
" 60	3	...	3	1	...	1	...	...	...	...	...	...	...
years and over	1	...	1	...	...	...	...	...	...	...	...	...	...
Total ...	8	...	8	12	...	12	2	...	2	...	...	...	23	...	23	29	...	29	11	...	11	6	...	6	...	...	...

127. The following table shows the number of cases of venereal diseases treated on sugar estates for the past three years :—

	1936.	1937.	1938.
Gonorrhoea ...	136	178	145
Chancroid ...	8	8	7
Syphilis (including tertiary) ...	107	171	196
Granuloma Venereum and Pudendi ...	...	3	5

128. Classified in age-incidence periods, the in-patients treated on sugar estates during the year were as follows :—

Age.	(a) SYPHILIS.												(b) Acute Gonorrhoea.			Chronic Gonorrhoea.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho- Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Under 1 year ...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...
1-under 5 years ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5-under 10 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10-under 20 ...	3	...	3	...	3	3	1	...	1	2	...	2	6	2	8	...	...	...	1	1	...	...	...	...	...	...	...
20-under 30 ...	4	3	7	...	9	9	2	2	4	1	...	1	14	4	18	2	...	2	1	1	2	...	...	...	...	...	...
30-under 40 ...	1	...	1	4	2	6	3	1	4	...	...	...	5	1	6	5	3	8	1	...	1	...	...	...	...	...	...
40-under 60 ...	...	1	1	2	3	5	...	...	...	...	...	...	5	1	6	2	1	3	...	...	...	...	...	...	...	...	...
60 years and over ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	8	4	12	6	17	23	6	3	9	3	...	3	31	9	40	9	4	13	2	2	4	...	...	...	...	...	...

129. The table below shows the out-patients (new cases) treated on sugar estates during the year classified in age-incidence periods :—

TABLE XXVII.

Age.	(a) SYPHILIS.												(b) Acute Gonorrhœa.			Chronic Gonorrhœa.			(c) Chancroid.			(d) Granuloma Pudendi.			(e) Lympho-Granuloma.		
	Primary.			Secondary.			Tertiary.			Hereditary.																	
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Under 1 year ...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
1-under 5 years ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5-under 10 ...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10-under 20 ...	14	7	21	1	2	3	...	...	...	3	...	3	12	1	13	3	...	3	...	...	...	...	1	1	...	...	...
20-under 30 ...	22	13	35	2	8	10	4	2	6	...	1	1	32	2	34	6	3	9	1	...	1	...	1	1	...	...	...
30-under 40 ...	13	13	26	2	8	10	2	2	4	...	...	...	12	1	13	11	1	12	1	...	1	...	1	2	3	...	...
40-under 60 ...	10	7	17	2	1	3	1	...	1	...	...	...	1	...	1	5	1	6	1	...	1	...	...	...	...	...	...
60 years and over ...	1	6	7	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	60	46	106	7	19	26	8	4	12	3	2	5	58	4	62	25	5	30	3	...	3	1	4	5	...	...	...

VENEREAL DISEASES CLINIC, PUBLIC HOSPITAL, GEORGETOWN.

130. *Staff.*—The Staff comprised—

The Medical Officer.

One wholetime male nurse.

One wholetime female nurse.

Two part-time male nurses.

Two part-time female nurses.

131. *Clinics.*—As hitherto, sessions were conducted on each week-day from 1 p.m. when the medical officer attended for consultations and seeing patients in general. Male patients received intermediate treatment (that is treatment prescribed by the medical officer) all day from 6.30 a.m. to 6 p.m. Women and children attended from 6.30 to 11 a.m. daily for their treatment.

132. *Pathological Examinations.*—A limited number of direct smears were examined in this department during the year. The majority of specimens for culture and direct examination as well as the serological work were referred to the Government Bacteriological Department.

133. *Syphilis.*—There were 759 new admissions for syphilis in all its stages. The majority of cases seeking treatment were, as hitherto, in the tertiary or late stage of syphilis. The number of new cases of early and infectious syphilis represented 17.1% of all cases of syphilis admitted.

134. *Gonorrhœa.*—The total number of cases of gonorrhœa—843—shows an increase over the previous year's figure. It will also be noted that the number of cases of acute gonorrhœa is the highest recorded for the past eight years. The number of cases in the acute stage represented 71.5% of the total number of admissions for gonorrhœa.

135. The ratio of early syphilis to acute gonorrhœa was 1 to 4.6. If all cases of gonorrhœa are included, the ratio is 1 to 6.5.

136. *Chancroid and Granuloma.*—The incidence of both conditions appears to be low. During a portion of the year "Dmelcos" cuti-reaction was employed in certain doubtful cases in the diagnosis of chancroid.

137. *Lympho-Granuloma Inguinale.*—Although not included in the statistical tables, a small number of these cases were investigated and treatment attempted. Frei Mouse Brain Antigen, a supply of which was a free gift from Dr. A. W. Grace, recently of the New York Hospital, N.Y., U.S.A., was used in the determination of the presence of this infection.

138. *Undiagnosed Cases.*—The number of these cases continue to be unnecessarily high. A fair proportion of these cases are quite definitely of venereal origin. They default after the first or second attendance, and, in many cases, fail to return for prescribed tests. The reduction of this incidence is of great importance. The remedy lies in the implementation of measures likely to reduce defaulting.

139. *The Child Welfare Centre.*—Co-operation between this Centre and the social diseases clinic continues. The Centre in Georgetown as well as others of this type in the districts altogether sent 82 cases of syphilis, and 52 cases with vaginal discharge complicating pregnancy.

140. *General Remarks.*—The increasing numbers attending this clinic indicate that a more widespread knowledge of this group of diseases and the facilities provided for specialised treatment are being generally recognised. An increase of staff to provide for evening clinics for the working class and others unable to attend during the day will be necessary and will be recommended for 1939. Experience with the sulphonamide compounds, particularly M & B 693, in the treatment of gonorrhoea has been limited owing to inadequate supplies of these preparations, but the available results indicate that a considerable advance by this form of treatment has been reached. It is hoped that adequate supplies of M & B 693 will be made available in 1939.

141. The following tables summarise for statistical purposes the work of the clinic during the year.

TABLE XXVIII.

CASES (NEW AND OLD)—MALE AND FEMALE—TOTAL 4,161 CASES.

	Sy. (1).	Sy. (2).	Sy. (3).	Sy. 3 (H).	Acute Gonorrhoea.	Chronic Gonorrhoea.	Chancroid.	Granuloma.	N.V.D.	Un- diagnosed.
New	105	25	604	25	604	239	27	24	89	8.8
Old	103	45	666	46	292	199	33	39	50	128
Total	208	70	1,270	71	896	438	60	63	139	946

TABLE XXIX.

ATTENDANCES—MALE AND FEMALE—TOTAL 24,232.

Half year.	Syphilis.	Gonorrhoea.	Chancroid.	Granuloma.	N.V.D.	Undiagnosed.
To June	7,121	2,302	121	257	71	2,274
To December	6,409	2,898	111	262	99	2,307
Total	13,530	5,200	232	519	170	4,581
Male	6,847	4,448	165	383	105	1,831
Female	6,683	752	67	136	65	2,750

TABLE XXX.

ATTENDANCES AT CLINIC SESSIONS.

Diseases.	Male.	Female.	Total.
Syphilis	6,847	6,683	13,530
Gonorrhoea	4,448	752	5,200
Chancroid	165	67	232
Granuloma	383	136	519
N.V.D.	105	65	170
Undiagnosed	1,831	2,750	4,581
Total	13,779	10,453	24,232

TABLE XXXI.
INJECTIONS GIVEN.

Half year.			*A.b.c.	Bismuth.	Tartar Emetic.	Vaccines.	Various Others.†
o June	...	...	4,247	5,205	485	946	752
o December	...	...	4,141	5,047	412	603	419
Total			8,388	10,252	897	1,546	1,171

* A.b.c. = Arseno-benzol compound.

† = Contramine, Ametox. S.u.P. 36.

TABLE XXXII.

A,—Total No. new cases treated	...	2,560
„ „ old „ „	...	1,601
Total New & Old „ „	...	4,161
B.—Total No. persons with V.D.	...	{ New 1,568 } 2,815
		{ Old 1,247 }
„ „ „ „ N.V.D	...	139
„ „ „ „ Undiagnosed	...	946
Total	...	3,900

TABLE XXXIII.

ATTENDANCES FOR INTERMEDIATE TREATMENT.

Males	...	20,668
Females	...	16,571
Total	...	37,239

TABLE XXXIV.

A.—DISMISSALS FROM CLINIC—CURED.

	Male.	Female.
Gonorrhœa	26	1
Chancroid	15	4
Syphilis	6	3
	47	8

B.—Non Venereal Diseases.
Male and Female.
139

TABLE XXXV.

DISTRICT INCIDENCE—MALE AND FEMALE PATIENTS.

Diseases.	Georgetown.	Lower East Coast.	Upper East Coast.	West Coast Demerara.	East Bank Demerara.	West Bank Demerara.	Berbice.	Demerara River.	Essequibo.		Total.		
											Old.	New.	Total.
Sy. (1) ...	37 49	9 15	1 2	4 4	7 9	5 6	1 1	...	1 1	O N	64 ...	...	87
Sy. (2) ...	20 7	10 6	...	...	3 4	2 2	1 1	1 ...	1 ...	O N	38 ...	...	22
Sy. (3) ...	333 280	92 124	6 11	17 25	64 34	27 34	...	6 9	3 11	O N	548 ...	...	529
Sy. (4) ...	28 11	11 10	...	...	4 2	...	...	...	...	O N	43 ...	...	25
Ac.G. ...	127 287	41 104	1 12	3 47	21 51	4 32	...	1 10	1 11	O N	199 ...	...	562
Ch.G. ...	68 100	30 39	2 4	12 11	14 30	4 10	2 1	1 1	2 10	O N	135 ...	...	206
Sy. (1) & Ac.G.	21 7	2 2	...	1 ...	2 2	...	...	...	...	O N	26 ...	...	14
Sy. (2) & Ac.G.	3 2	1 ...	...	...	...	...	...	...	...	O N	4 ...	...	3
Sy. (3) & Ac.G.	29 15	10 5	...	4 1	7 3	2 9	...	...	...	O N	52 ...	...	36
Sy.H & Ac.G.	2 ...	...	...	...	1 ...	...	...	...	...	O N	3...	...	...
Granuloma P.	12 8	5 2	...	3 1	4 1	1 1	...	...	...	O N	25 ...	...	14
Chancroid ...	9 11	1 7	1 1	...	3 ...	1 2	1 1	...	...	O N	16 ...	...	23
Sy. & Granuloma	1 ...	...	1 ...	...	...	...	...	...	...	O N	1 ...	...	1
Sy. (2) & Granuloma	...	1 ...	...	...	...	...	...	...	...	O N	1...	...	...
Sy. (3) & Granuloma	3 4	1 2	...	1 1	2 ...	...	...	...	...	O N	6 ...	...	8
Ac.G. & Granuloma	1 ...	...	...	...	1 ...	...	...	...	...	O N	1 ...	...	1
Ch.G. & Granuloma	1 ...	...	...	...	...	...	...	...	...	O N	1...	...	...
Sy. (1) & Chanc.	3 ...	1 ...	...	...	1 ...	...	...	...	...	O N	5 ...	...	1
Sy. (2) & Chanc.	...	...	...	...	...	...	...	...	...	O N	...	...	...
Sy. (3) & Chanc.	6 ...	1 ...	...	1 ...	1 ...	...	...	...	...	O N	9...	...	...
Ac.G. & Chanc.	6 ...	1 ...	...	...	...	1 ...	...	1 ...	...	O N	7 ...	...	2
Ch.G. & Chanc.	...	1 ...	...	...	1 ...	1 ...	...	...	...	O N	2 ...	...	1
Sy. (1) & Ch.G.	4 ...	1 2	1 ...	...	1 ...	...	...	...	...	O N	7 ...	...	2
Sy. (2) & Ch.G.	...	...	1 ...	...	1 ...	...	...	...	...	O N	2...	...	...
Sy. (3) & Ch.G.	30 17	12 9	...	3 1	6 2	...	...	...	1 ...	O N	52 ...	...	31
Sy.H. & Ch.G.	...	...	...	...	...	...	...	...	...	...	...	...	...
	1,532	556	48	143	282	147	19	31	43	...	1,247	1,568	2,815
Undiagnosed N.V.D.	...	...	...	...	...	...	...	...	...	...	...	...	946 139
Total No. of Patients											...	...	3,900

TABLE XXXVI.

CASES REFERRED FROM ANTE-NATAL CLINICS.

Syphilis (1)	...	2
Syphilis (3)	...	80
Acute Gonorrhœa	...	1
Chronic Gonorrhœa	...	11
Leucorrhœa	...	40
		134

TABLE XXXVII.

RACIAL INCIDENCE OF DISEASES.

Race.	Syphilis.			Gonorrhœa.			Chancroid.			Granuloma Pudendi.			N.V.D.			Undiagnosed.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Europeans	4	...	4	1	...	1	1	...	1	...	...	...	1	...	1	2	...	...
Portuguese	48	22	70	32	6	38	1	1	2	3	...	3	1	...	1	9	5	1
East Indians	178	122	300	277	60	337	13	2	15	6	1	7	39	9	48	80	126	206
Africans	475	611	1,086	668	153	821	19	16	35	31	17	48	36	46	82	174	464	638
Mixed	53	97	150	95	31	126	4	1	5	3	2	5	3	4	7	26	53	79
Chinese	5	3	8	5	1	6	1	...	1	...	...	...	...	...	...	1	2	3
Aboriginal Indian	1	...	1	3	1	4	1	...	1	...	...	...	...	...	...	2	2	4
Others	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...
Total	764	855	1,619	1,081	253	1,334	40	20	60	43	20	63	80	59	139	294	652	946

TABLE XXXVIII.

DISEASE INCIDENCE IN MARRIED AND UNMARRIED.

			FEMALES.			MALES.		
			Married.	Unmarried.	Total.	Married.	Unmarried.	Total.
Syphilis	...	...	525	330	855	264	504	764
Gonorrhoea	...	...	158	95	253	282	799	1,081
Chancroid	...	...	5	15	20	14	26	40
Granuloma	...	...	2	18	20	4	39	43

TABLE XXXIX.

OCCUPATION OF PATIENTS ATTENDING SOCIAL DISEASES CLINIC 1933.

FEMALES.			A.
Domestic Servants	...	...	996
Bakers	...	...	1
Factory Workers	...	...	3
Clerks	...	...	5
Laundresses	...	...	45
Field Labourers	...	...	148
Scholars...	...	...	66
Dancer	...	...	1
Teachers	...	...	3
Milliners	...	...	28
Not stated (or nil)	...	...	363
Total	...	...	1,664
MALES.			B.
General Labourers	...	...	1,475
Tradesmen	...	...	205
Artisans	...	...	151
Clerks	...	...	42
Seamen	...	...	49
Scholars	...	...	34
Others	...	...	230
Total	...	...	2,236

TABLE XL.

NEW ADMISSIONS AND OLD CASES WITH SEX DISTRIBUTION 1938.

	New Cases.			Old Cases.	
	M.	F.		M.	F.
Syphilis (1) ...	91	14		77	26
Syphilis (2) ...	23	2		31	14
Syphilis (3) ...	272	332		241	425
Syphilis H. ...	8	17		21	25
Acute Gonorrhoea ...	532	72		238	54
Chronic Gonorrhoea ...	182	57		131	68
Chancroid ...	21	6		19	14
Granuloma Pudendi ...	16	8		27	12
N.V.D. ...	60	29		31	19
Undiagnosed ...	329	489		27	101
Total ...	1,534	1,026		843	758

142. *Leprosy*.—The number of new admissions to the Leprosarium was 65, 41 males and 24 females. There were 21 deaths—17 males and 4 females, giving a death-rate of 4.05 per cent. of the total number of inmates.

143. The staff includes 10 Sisters of Mercy from the United States of America distributed as follows :—

One is Assistant Superintendent of the female hospital, one performs the duties of Nurse and Theatre Sister on the female side, two serve as Nurses and Theatre Sisters on the male side, two have the care of the children in the Bishop Galton Home, two have the care of the children in the Lady Denham Home, one acts as relief nurse in case of illness, half-pay recreation, vacation leave, etc., while the remaining one acts as housekeeper to the community. These Sisters continue to render invaluable services to the Institution and their presence and their devotion have had a marked effect on the conduct of the patients.

144. The programme of maintenance and reconstruction works was continued during the year by the Public Works Department. Much difficulty is still experienced in finding room for acute cases in the Institution, the total capacity of the male and female infirmaries being only 75 beds out of an average total of 397 cases.

145. The following are extracts from the annual report for the year 1938 of Dr. F. G. Rose, M.B.E., B.A., M.D., (Camb.), M.R.C.P., (Lond.), D.M.R. & E. (Camb.), Medical Superintendent, Leprosy Hospital :—

“ *Buildings, etc.*—The programme of improvements was continued during the year by the Public Works Department, the following works being “carried out :—

ADMINISTRATION BLOCK.

“ *Attendants' Mess*—Addition of kitchen with platform and staircase, building of shed over entrance to Medical Superintendent's Office.

“ *Attendants' Mess, Medical Superintendent's Office, Dispensary and Laboratory*—General repairs to upper and lower flats, floors, walls, sills, posts, etc., repairing and renewing of pipes and gutters. No painting was done of any of the new work.

MALE COMPOUND.

“ New Stable.

“ Central water supply scheme with iron tower, water tank, electric pump, etc.

“ *No 2 Ward*.—Septic tanks, basins to water closets and shower-baths with connections. Repairing and renewing of gutters and pipes.

FEMALE COMPOUND.

“Attendants Quarters.”—Provision of water closet with septic tank and bath-room with shower bath and connecting passage (no painting done), also repairs of sills and steps.

“Female Cottages.”—Two water closets and baths to No. 4 cottage, landings connecting cottages 2, 3, 4 and 5. Work incomplete and no painting done. Renewing of columns and sills to Nos. 3, 4 and 5.

“I have again to report the grave inconvenience and hardship to patients caused by the lack of accommodation for acute and for infirm cases in the Institution, the total capacity of the male and female infirmaries being only 75 beds for an average of 397 patients.

“Grounds.”—A considerable amount of bonification has been done and flower and vegetable gardens prepared. The cricket ground and tennis lawns have been well kept. The work of bonification is still in progress.

“Water Supply.”—A new central water supply scheme was provided consisting of a central water-tower of 3600 gallons capacity served by a motor pump which draws water from the pipe lines of the artesian well at Clonbrook, four miles distant.

“Sanitation.”—Septic tanks have now been installed in most places and only 11 pails have now to be used for the disposal of excreta.

“Mosquitoes have been reduced in numbers very considerably of recent years, but seasonal visitations of flies have caused great inconvenience.

“The grounds in general and the wards have been kept clean and there has been no outbreak of acute infectious disease.

“Dietary.”—Considerable difficulty has been experienced in obtaining green vegetables but measures have been taken to fulfil this need from kitchen gardens which have been provided in the Compound.

“Complaints have been made about the cooking of the food only by the paying patients.

“The quality of the bread, which is obtained from the prison bakery in Georgetown, of the milk and of the beef has been generally unsatisfactory, and steps are being taken to secure improvement.

“The Patients—

“(a) Discipline.”—The behaviour on the whole was satisfactory save for a sit-down strike by the patients which commenced on 29th March, during the absence on leave of the Medical Superintendent, and ended on 31st March after a special visit paid by the Committee of Official Visitors. The strike seems to have been due to dissatisfaction over a threatened reduction of wages.

“There were no absconders.

“(b) Occupation.”—The usual minor repairs, painting, weeding, bonification, making of boots, shoes and slippers, and making of clothing for the patients were done by attendant and patient artisans and labourers.

“Many patients occupied themselves in farming, poultry-rearing, etc.

“Patients also assisted in maintaining cleanliness in the grounds and buildings, dressing ulcers, and giving treatment in the electro-therapeutic department.

“Sports and Pastimes.”—Cricket and tennis were played as usual throughout the year.

“There is a flourishing Attendants’ Sports Club to which most of the staff belong and which fulfils a very useful function in the Institution, having been in existence now for 13 years.

“The combined cricket team made up of staff and patients under the leadership of Mr. W. Shankland, Warden, had a successful season, playing 39 matches, of which 26 were won, 8 drawn and 5 lost.

“The cricket ground is now the second largest in the Colony and compares favourably with any other first class ground.

" It is a very important addition to the amenities of the Institution and is used for nearly all out-of-door games, rallies, etc.

" The team entered for the Northcote Cup and was defeated by an All-Berbice team by the narrow margin of 32 runs on the Adelphi ground.

" The usual dances and entertainments were organised ; the wireless receiving set and " talkie " programmes were, as usual, much enjoyed.

" A successful cycle and athletic sports meeting took place during the month of August.

" The guide troops and brownie packs, under the leadership of Mrs. F. G. Rose, Guide Commissioner for the East Coast, Demerara, maintained their activities.

" Two scout troops, Galton Home and Denham Home, are also maintained.

" *Religious Observances.*—The Rev. Canon Salmon visited and ministered to patients of the Anglican Communion during the year. The Rev. R. Dea, S.J., replaced the Rev. H. Pendlebury, S.J., as Catholic Chaplain on September 9th, 1938, and the Rev. L. Porter replaced the Rev. J. B. Broomes as Minister to the Wesleyan Methodist congregation on May 20th, 1938.

" The Rev. C. Biles ministered to the Presbyterians throughout the year. Regular services were also held by the Seventh Day Adventist Sect.

" *Visitors.*—Official visits were paid by His Excellency the Governor, Sir Wilfrid Jackson, K.C.M.G.; the Board of Official Visitors, comprising Mesdames S. H. Bayley and C. W. H. Collier, the Very Rev. J. L. Morrison, S.J., the Rev. Canon Rowe, and Mr. A. Groves; the Rt. Rev. the Bishop of Guiana; Dr. J. A. Browne, Government Ophthalmologist; the Director of Medical Services, the Hon. N. M. MacLennan; Dr. B. N. V. Wase-Bailey, the Government Medical Officer of Health; the District Engineer, Mr. R. B. Craig; and the County Superintendent of Police, Mr. T. H. Whittingham.

" The Leprosy Board comprising the Medical Superintendant as Chairman, the Government Bacteriologist, the Government Medical Officer of Health, the Senior Physician, Public Hospital, Georgetown, and Dr. F. T. Wills, held three meetings for the purpose of confirming admissions and examining cases for discharge.

" Other visitors included His Honour the Chief Justice, Sir Bernard Crean; the Attorney General, the Hon. J. H. B. Nihill; the Venezuelan Consul and several visitors from abroad.

" *Gifts.*—Many gifts of books, magazines, newspapers, toys, sweets, etc. were received and distributed.

" A sum of \$146.92 was collected by Mrs. F. G. Rose from various firms and individuals out of which Christmas gifts for all the patients were provided.

" *School.*—There were 24 scholars on the register of the Bishop Galton Home School and 15 on the register of the Lady Denham Home School, the average attendance being 20 and 13 respectively.

" *The Children.*—There were 10 girls and 18 boys in the Bishop Galton Home and 12 girls and 10 boys in the Lady Denham Home at the end of the year. The children in both Homes were kept fully occupied and trained in the cultivation of the soil and in other pursuits.

" *Treatment.*—The main line of treatment remains the injection, intramuscular and intra-dermal, of the esters of Hydnocarpus Oil; the results continue to be satisfactory. 632 prescriptions were written for male and 367 for female out-patients from the cottages, while 96 males and 52 females were treated as in-patients during the year.

" 31 operations were performed on the male side and 12 on the female, their nature being as follows :—

Transplantation of nerve	...	...	2
Right Inguinal Hernia	...	...	1
Excision of Nodules	...	...	4
Amputations :—			
Leg	...	...	1
Toe	...	...	5
		—	
		6	6
Removal of Cataract	...	...	2
Incision and Drainage	...	...	8
Curetting Bone	...	...	10
Sequestrotomy	...	...	2
Excision of Necrosed Bone	...	...	7
Resection of Rt. Tibia and Fibula	...	...	1
		—	
Total	...	...	43

" 5 operations were performed under a general anæsthetic, the rest with the aid of spinal or local anæsthesia.

" The supply of instruments and of beds was again replenished during the year.

" 250 sessions were held in the electro-therapeutic department, and 2,667 treatments were administered to 55 male and 26 female patients.

" Galvanism, faradism, ionization, diathermy and ultra-violet radiations were used.

" The following laboratory investigations were made :—

Blood for Malaria Parasite & Blood Counts	...	23
Examination of Fæces	...	8
Examination of Urine	...	66
Sputum for Tuberculosis	...	6
Nasal Smears	...	127
Skin Smears	...	52
Throat Swab for K.L.B.	...	3
	—	
Total	...	285

" At the end of 1938 there were 871 cases of leprosy, including active, quiescent and arrested, known to the authorities and believed to be alive.

" Of these 417 were inmates of the Leprosy Hospital at Mahaica, the remaining 454 being out-patients attending for treatment or examination or both at the various clinics.

" Since 1925, 158 persons have been lost sight of out of a total of 1196 for periods varying from 1 year to 10 years or more. Nearly all these belong to the arrested non-infective class.

" 83 patients were discharged as quiescent and there were 60 new admissions of persons suffering from leprosy.

" 7 arrested cases relapsed during the year.

" The following were the types of cases admitted :—

Cutaneous.	Neural.	Mixed.	Minor Tuberculoid.	Total.
22	30	3	5	60

" 20 new out-patients were seen, classified as follows :—

Cutaneous.	Neural.	Minor Tuberculoid.	Total.
3	15	2	20

"21 deaths of persons suffering from leprosy occurred in the Leprosy Hospital, the causes of death being as follows :—

Pulmonary Tuberculosis	...	...	4
Exhaustion from advanced Cutaneous Leprosy	...	...	4
Lobar Pneumonia	...	...	3
Granuloma Inguinale	...	...	2
Bronchitis	...	...	2
Nephritis	...	...	1
Cerebral Haemorrhage	...	...	1
Cerebral Malaria	...	...	1
Hepatitis	...	...	1
Gangrene	...	...	1
Senility	...	...	1
Total	...	...	21

"*Out-Patient Clinics.*—51 visits were paid to the Out-Patient Clinic in Georgetown, 12 to that in New Amsterdam, 11 to the Corentyne Coast, and 9 to Essequibo, including Leguan, Wakenaam, Suddie, and Charity on the Pomeroon River.

"The following were the numbers of patients seen and attendances made :—

Clinic.	Number of Sittings.	Number of Patients.	Number of Attend- ances of Patients.
1. Georgetown	51	221	1,108
2. Mahaica	136	107	365
3. New Amsterdam	12	105	233
4. No. 63, Corentyne Coast	11	59	143
5. Essequibo —(Including Leguan, Wakenaam, Suddie and Charity	9	39	75
Total	219	531	1,924

"*British Empire Leprosy Relief Association.*—The Lady Denham Home Committee met on one occasion in conjunction with the Executive Committee, and on three occasions independently.

"The Entertainment Committee concerned itself as usual with the provision of funds for the hire of cinema films and for the purchase of cricket balls and gear, playing cards, etc., for the use of the patients of the Leprosy Hospital.

"Towards the end of the year a generous bequest of \$200 was received from the Estate of the late Mrs. D. M. Hutson, through the Executor, Mr. A. McLean Ogle, that sum having been bequeathed by Mrs. Hutson for the benefit of the patients.

"The Executive Committee met on two occasions.

"The Central Committee met on 26th January, 1938, and again at the Annual Public Meeting at the Town Hall on Wednesday, November 23rd, when His Excellency the Governor took the Chair.

"The following article was contributed to the Leprosy Conference held in Cairo, Egypt :—

LEPROSY IN BRITISH GUIANA, AN EXPERIMENT IN PROPHYLAXIS."

146. The statistical returns of the Leprosy Hospital for the year are as follows:—

TABLE XLI.

SHOWING NUMBER OF PATIENTS TREATED AND PERCENTAGE MORTALITY, 1938.

		M.	F.	T.
Number of patients on 31st December, 1937	...	228	147	375
New admissions during 1938	...	41	24	65*
Re-admitted once in 1938	...	38	29	67
Re-admitted twice in 1938	...	7	4	11
Re-admitted thrice in 1938	...	...	...	...
Total number treated during 1938 at Leprosy Hospital	...	314	204	518
Died in Leprosy Hospital during 1938	...	17	4	21
Daily average number treated	...	243	154	397
Death rate	...	5.4	2.0	4.05
Highest number of patients, 1938	...	263	158	421
Lowest number of patients, 1938	...	229	149	378

* This number includes 4 births and 1 male patient admitted during the absence of the Medical Superintendent on leave and subsequently discovered not to be suffering from Leprosy.

N.B.—Of the 60 new admissions, 8 had previously been out-patients, 6 male and 2 females.

TABLE XLII.
SHOWING NUMBER OF ADMISSIONS, DISCHARGES, DEATHS, ETC., CLASSIFIED ACCORDING TO RACE AND SEX.

		EUROPEANS.				EAST INDIANS.				Chinese.		Aboriginal Indians.		Blacks.		Mixed Races.		Total.		Grand Total.
		Other than Portuguese.		Portuguese.		Immigrants.		B. G. East Indians.		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
...	1	1	3	31	16	36	19	4	2	...	...	112	78	31	28	228	147	375		
...	...	1	1	9	6	13	4	1	...	...	...	12	10	2	2	38	23	61		
...	1	...	...	9	10	13	9	...	1	...	...	13	8	2	...	38	29	67		
...	...	...	...	3	2	3	1	...	1	...	...	1	...	...	...	7	4	11		
...		
...		
...	2	2	4	52	34	65	33	5	4	...	...	139	97	37	39	314	204	518		
Total																				
...	
...	1	...	...	3	2	4	7	1	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	9	8	8	1	...	1	...	...	...	...	...	...	...	...	...	...
...	...	...	...	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	
...	
...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	
...	
...	1	1	13	34	21	52	20	4	1	...	...	122	79	31	28	257	156	413		
Total																				

TABLE XLIII.

SHOWING CLASSIFICATION OF PATIENTS ACCORDING TO DISTRICT, FORM OF LEPROSY AND OCCUPATION.

County of Demerara.	M.	F.	T.	County of Berbice.	M.	F.	T.	County of Essequibo.	M.	F.	T.	Form of Leprosy.	M.	F.	T.
Georgetown ...	77	46	123	New Amsterdam ...	6	4	10	North Essequibo ...	6	3	9	Neural ...	132	83	215
East Coast, Demerara.	42	30	72	Corentyne Coast ...	28	15	43	South Essequibo ...	5	3	8	Cutaneous ...	99	61	160
West Coast, Demerara	19	12	31	East Bank, Berbice ...	8	4	12	Pomeroon ...	12	2	14	Mixed ...	23	10	33
East Bank, Demerara..	14	9	23	West Coast, Berbice...	6	6	12	Bartica ...	4	1	5	Minor Tuber- culoid ...	3	2	5
West Bank, Demerara.	11	5	14	Canje, Berbice ...	4	6	10	North-West Dis'tric't..	1	..	1				
Demerara River ...	8	6	14	Berbice River ...	6	6	12								
Total ...	171	106	277	Total ...	58	41	99	Total ...	28	9	37	Total ...	257	156	413

Occupation.	M.	F.	Total.
Labourers ...	149	51	200
Bookbinders ...	2	..	2
Salesman ...	2	..	2
Shoemakers ...	7	..	7
Scholars ...	33	24	57
Cartman ...	1	..	1
Chauffeurs ...	3	..	3
Tailors ...	8	..	8
Clerks ...	4	..	4
Teachers ...	4	1	5
Boiler Maker ...	1	..	1
Farmers ...	4	2	6
Carpenters ..	7	..	7
Painter ...	1	..	1
Woodcutter ...	2	..	2
Musicians ...	2	..	2
Electricians...	2	..	2
Vagrants ...	2	1	3
Baker ...	1	..	1
Porter ...	1	..	1
Mechanic ...	1	..	1
Milk-vendor ...	1	..	1
Telegraphist ...	1	..	1
No occupation ...	15	7	22
Fishermen ...	2	..	2
Messenger ...	1	..	1
Domestics ...	..	41	41
Seamstresses ...	..	12	12
Housewives...	..	13	13
Washers ...	..	2	2
Huckster ...	..	1	1
Basket Maker ...	..	1	1
Total ...	257	156	413

TABLE XLIV.

TABLE SHOWING CLASSIFICATION OF PATIENTS ACCORDING TO AGE, RACE, AND SEX.

	EUROPEANS.				EAST INDIANS.				Chinese.		Aboriginal Indians.		Blacks.		Mixed Races.		Total.		Grand Total.
	Other than Portuguese.	Portuguese.	Immigrants.	B.G. East Indians.															
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
1 to 5 years	1	1	..	..	1	1	2
6 to 10 "	1	..	..	2	..	..	..	..	..	3	2	1	..	6	3	9
11 to 20 "	3	1	..	..	10	4	2	1	..	..	18	11	..	11	33	28	61
21 to 30 "	1	..	5	..	..	..	18	3	..	..	..	..	32	17	..	6	54	35	89
31 to 40 "	..	1	3	1	..	..	11	7	2	..	..	..	31	20	7	6	71	25	96
41 to 50 "	1	..	11	4	6	5	..	..	..	..	12	15	4	2	34	26	60
51 to 60 "	1	1	17	12	5	1	..	1	..	..	10	7	2	3	35	25	60
61 to 70 "	5	5	..	..	..	..	..	..	13	2	2	..	20	7	27
71 to 80 "	1	..	..	..	..	1	..	..	..	3	..	..	1	4	5
81 to 90 "	2	1	..	1	2	2	4
Total ...	1	1	13	4	34	21	52	20	4	3	..	..	122	79	31	28	257	156	413

147. *Filariasis*.—The deaths registered throughout the whole Colony were 52. Of these only 44 were certified by registered medical practitioners. Of the 52, 4 were Europeans (Portuguese), 5 East Indians, 1 Aboriginal Indian, 34 Black, and

8 of mixed races. No less than 65.4 per cent. of the deaths therefore occurred amongst Africans who represent only 38.8 per cent. of the total population of the Colony.

148. Of the 52 deaths, 23 occurred amongst males and 29 amongst females.

149. In the public hospitals of the Colony 631 persons were recorded as suffering from filariasis in the out-patient departments, of whom 171 were males and 460 females. Of in-patients there were 336 cases with 14 deaths. Of these 299 cases and 14 deaths were in respect of the Public Hospital, Georgetown. The preponderance of cases and deaths at this hospital does not necessarily mean that they originate in the city, but with the onset of the septicæmia many cases are referred to the central hospital.

150. As regards elephantiasis only 24 male and 25 female cases are recorded as out-patients in all the hospitals for the year, with 31 in-patients and no deaths.

151. *Erysipelas*.—This disease became reportable in 1934.

The cases reported since then are as follows :—

1935—12 cases ; 1936—14 cases ; 1937—8 cases ; and
1938—2 cases.

152. *Ophthalmia Neonatorum*.—This disease has been notifiable since 1930. Over that period an increasing number of cases varying from 48 to a maximum of 94 in 1935 have been recorded. In 1937 there were 86 cases reported and in 1938 there were 57 cases reported. This is a subject so closely related to the practice of midwifery that it is not possible to express confidence in the figures as representing the true situation. Of these, 35 cases were reported from Georgetown and 22 from elsewhere.

153. *Quarantinable Diseases*.—There were no cases of plague, cholera, yellow fever, small-pox or typhus during the year.

IV.—HYGIENE AND SANITATION.

CENTRAL BOARD OF HEALTH.

Annual Statement for 1938.

154. The personnel of the Board, as appointed by His Excellency the Governor, was, on the 1st of January, 1938, as follows :—

The Surgeon-General, Chairman.
His Worship the Mayor of Georgetown.
His Worship the Mayor of New Amsterdam.
Hon. E. A. Luekhoo, O.B.E.
Hon. M. B. G. Austin, O.B.E.
Hon. J. I. de Aguiar.
The Government Veterinary Surgeon.
Mr. F. H. Allen.
Mr. C. Shankland.
Mr. C. H. Palmer.
Dr. A. J. Craigen.
Dr. T. T. Nichols, with the
Government Medical Officer of Health as Chief
Executive Officer, and
Mr. C. H. Harewood, Secretary to the Board.

155. Dr. B. N. V. Wase-Bailey continued to act as Surgeon-General and Chairman of the Board until the arrival in September of Dr. Norman M. MacLennan, the Director of Medical Services.

156. Hon. J. I. de Aguiar was absent on leave from the 12th of February to the 31st of August, 1938.

157. The Government Veterinary Surgeon (Major T. Bone, O.B.E.), retired in May and his place was filled by the Hon. M. B. Laing, Commissioner of Labour and Local Government.

158. The term of office of Mr. C. H. Palmer (Manager of Pln. La Bonne Intention) expired in March; Mr. W. H. Richards (Manager of Pln. Lusignan) was appointed.

159. The period of appointment of the following members terminated and their re-appointment was effected as follows :—

Dr. A. J. Craigen on the 4th December, 1938.

Mr. F. H. Allen on the 29th December, 1938.

160. Dr. P. A. T. Sneath, Assistant Government Medical Officer of Health, Berbice, was appointed to act as Government Medical Officer of Health, Georgetown, on 23rd May, 1938, and continued to act for the remainder of the year.

161. The ordinary monthly meetings and three extraordinary meetings were held in 1938. There were no meetings in August and December for want of a quorum. An informal meeting of the Board with Dr. F. L. Soper and Dr. Mark F. Boyd of the Rockefeller Foundation was held on 28th December, 1938.

162. *General Sanitary Measures*.—Six hundred and thirty-two building applications were dealt with by the Board in its capacity as the Local Sanitary Authority of Rural Sanitary Districts under Section 13 (2).

163. One hundred and fifty-two plans were submitted for approval for the laying out of land for building purposes under section 135 (1). One hundred and nineteen certificates under section 135 (4) were issued.

164. As regards trades and industries, the following applications were dealt with :—

Offensive trades (section 95) :—

20 coconut factories were approved.

1 coconut factory was not approved.

Other trades and industries approved :—

1 soap factory and 194 rice mills (under the Rice Factories Ordinance, No. 26 of 1933).

165. Other applications considered included permission for the establishment of five schools (section 60 (1)), and two burial grounds (section 64 (1)).

166. A number of miscellaneous matters were dealt with in addition to some of the more important items mentioned before.

167. The sub-committee of the Board appointed to visit Berbice on the subject of the lay-out of lands submitted its report. Members of this committee were Messrs. C. Shankland, Chairman, F. H. Allen and C. H. Palmer.

168. In March, 1938, a medical mission visited the Rupununi district in consequence of reports received from this district that there existed a disease showing fever, jaundice and black vomit followed by death in about four days. This disease was suspected to be "jungle fever". A report of the mission's work is to be found herewith—(paragraphs 102—106).

169. His Majesty's Consul at Caracas, Venezuela, reported that there was an outbreak of alastrim in Venezuela during the year, and steps were taken to prevent the entry of the disease, particularly *via* the North-West District of the Colony.

170. In June, anthrax was reported to have occurred on the East Coast of Berbice and the Chairman of the Board approached the Colonial Secretary as regards issuing an order under section 44 of the Ordinance for the control of milk supplies. The order was issued and remained in force until September when the restrictions were removed.

General Preventive Measures.

171. The following tables show in detail the work of the district sanitary inspectors.

TABLE XLV.

Inspections of lots.	Notices served.	Prosecutions.	Convictions.	Withdrawn.	Dismissed.	Amount of fines.
105,637	14,640	484	473	8	3	\$368.08

Lots weeded.	Drains weeded.	Drains dug.	Trenches cleaned.	Ponds cleaned.	Water Receptacles screened.
7,975	5,143	1,449	971	263	4,192

TABLE XLVI.

Latrines erected.	Latrines removed and re-erected.	Latrines repaired.	Latrines limewashed.	Cesspits emptied.	Cesspits oiled.
1,140	959	1,923	2,489	70	32,014

TABLE XLVII.

	1937.	1938.
Inspection of provision shops ...	6,386	4,688
Provisions shops cleaned by order ...	1,450	1,031
Provision shops certified ...	85	85
Inspection of bakeries ...	1,532	1,176
Bakeries cleaned by order ...	400	314
Bakeries certified ...	8	10
Samples of foodstuffs examined ...	164,926	140,175
Samples of foodstuffs condemned ...	748	403
Inspection of butcheries ...	5,397	4,975
Carcases inspected ...	9,884	9,327

TABLE XLVIII.

Milk Sampling, Inspection of Cowpens, etc.	1937.	1938.
Cattle-pens certified as sources of milk supply...	658	546
Licences issued for the sale of milk ...	1,088	1,030
Persons prosecuted for selling milk unlawfully ...	15	24
Persons prosecuted for selling adulterated milk ...	144	154
Inspection of cattle-pens ...	3,852	3,367
Cattle-pens cleaned by order ...	730	767

TABLE XLIX.

Results of Milk Sampling.	1937.	1938.
Samples taken ...	1,710	1,659
Samples genuine ...	1,561	1,505
Samples adulterated ...	147	154
Amount of fines ...	\$ 1,107.60	\$ 1,240.70

TABLE L.

PERCENTAGE OF ADULTERATED MILK SAMPLES—				
East Coast, Demerara ...	...	...	9.4%	11.0%
West Coast, Demerara ...	...	...	6.3%	6.4%
East Bank, Demerara ...	...	...	9.6%	10.9%
West Bank, Demerara ...	...	...	4.9%	10.6%
Demerara River* ...	...	...	22.0%	17.5%
Essequibo ...	...	...	6.4%	6.0%

172. Of specified sanitary improvements carried out there were 61,688 as compared with 63,444 in the previous year.

173. Cases taken to Court number 484; of these 8 were withdrawn and 3 dismissed, the number of convictions being 473.

174. *Routine Departmental Activity.*—Again stress must be laid upon the fact of the steadily increasing special duties of sanitary inspectors and the consequential reflection upon the time remaining to them for the routine inspection of premises. Whilst the principle of a gradual increase in the sanitary staff has been accepted, it is not yet possible to reduce the areas of the existing thirty-one districts to a size compatible with what should obtain in this connection.

175. Originally, a sanitary inspector was appointed to a specified village and his activities were limited to the boundaries of that village. With the rapid expansion of housing eastwards and westwards from villages and along the coastlands, the department was faced with the necessity for extending those districts in such manner as to link up the spaces intervening between them and this has meant a larger increase in work. It has also meant considerable increase in the mileage to be travelled by sanitary inspectors, who at present are restricted to the use of push bicycles, in the number of premises to be inspected, and the assistance given to property owners in the laying out of land and in the preparation of building plans. In respect of the last mentioned it should be recalled that in very many instances the owner or householder is unable to read or write, and the filling in of the building application form and the drawing of the scale plan have to be done entirely by the sanitary inspector.

176. *Housing and Town Planning.*—Housing to a limited extent has been subject to control in the terms of the District Bye-Laws, 1911. The cardinal defect of these has been amply demonstrated in the organised districts by gross overcrowding of the land, which in a country of great area and small population must either be explained by a herding instinct or a desire on the part of landlords to realise the maximum return on capital investment upon what may be considered to be suitable building sites. Suitability of sites is largely determined by the effectiveness of main drainage. Entire absence of drainage by no means precludes settlement of certain areas which may for the greater portion of the year be entirely submerged or subjected to regular tidal flooding. This, as in other parts of the world, has been met by stilted structures that are a feature of the domestic dwellings of this Colony.

177. Another factor that is responsible for the irregularities of building sites arises from the archaic system of land division, as a result of which an owner may be in possession of a strip of land several thousand feet in length but so narrow that even the meanest house cannot be erected in compliance with the building bye-laws. The consequence of this has been that the mutual disregard of boundary limitation in many places has been observed to such an extent that for practical purposes boundaries do not exist and the application of by-laws is rendered futile.

178. This problem has been better controlled by laying out something resembling village sites, especially in Demerara, under the aegis of the Local Government Board. In Essequibo and Berbice, while such lay-outs may have in some instances been satisfactorily delineated on plans, the execution on the land has been generally most unsatisfactory.

179. The Public Health Ordinance, 1934, was designed to exercise greater control over such sub-division of land. In the absence of by-laws which effectively prevent the overcrowding of land, the mere delineation of boundaries and provision of means of access has by no means solved the problems. In point of fact, the restrictions that have been imposed have done little more than impede the extension of building within areas where land is not laid out. This has fostered a dis-

respect for the law wherein it is often simpler to pay the nominal penalty for a breach of the Ordinance than to comply with its strictures.

180. Provision exists for town planning only upon an approach of the Local Sanitary Authority to the Central Board of Health with the initial requirement that the latter Authority should declare the place concerned an unhealthy area. As yet no local authority has so approached the Central Board of Health. Such a scheme of town planning would be beyond the competency of that body as at present constituted.

181. To meet these needs in another way, certain proprietors in the County of Berbice have petitioned for re-partition of their land with the dual purpose of adjusting their holdings and laying out domestic building sites flanking the public roads. For that purpose a Sworn Land Surveyor has been seconded to the Government Health Department. As yet progress in this has been very slow and has produced little else than working plans with a certain amount of voluntary compliance with boundary restrictions which have no legal validity until incorporated into a re-partition.

182. This approach to the solution cannot be considered as town planning for the reason that no provision is possible under these conditions to afford restrictive zoning or to provide the necessary community reservations for markets, open spaces, playing fields, etc. Furthermore, the problem of effective drainage and flood protection remains for solution before the activities in hand may be viewed with final satisfaction. Structural control of housing outside the urban sanitary districts has had little practical application. Questions of ventilation and lighting are necessarily of minor significance under the climatic and habitual conditions that obtain in this Colony. Until the problems of overcrowding of land are solved the control of the dwelling-house itself must be of secondary importance.

183. From a structural viewpoint, housing in the urban sanitary districts, especially in Georgetown, is capable of greater technical control than elsewhere in the Colony. While the division of land in these areas is observed with some precision due to lengthy occupation and experience, an overcrowding of land and an absence of restriction in types of housing is to be observed. The wide boulevards of Georgetown arising from the adaptation of the old system of canals as streets and open spaces reserved for various purposes reduce the density of occupation over the whole area. There is also general overcrowding of occupied land here with a curious admixture of structures wherein reasonably satisfactory domestic buildings serve as a front to most inferior dwellings of the tenement and slum classes. Overcrowding of the latter of these has been the subject of several reports, but as yet no serious correction of this fault has been undertaken, presumably because of the costs that would arise from any rehousing scheme which must involve an extension of the city boundaries.

184. The problems of housing on the sugar estates arise from the needs originally associated with the accommodation of indentured labour. With the cessation of this, the "range" dwellings continued to be allocated to the use of resident labourers. The control of these until recently has been left to the managements of the respective estates. No precise knowledge as to the degree or extent of over-crowding of dwelling units is available. For some years families regularly employed by certain estates have been allocated small agricultural plots where they have erected dwellings to meet their own requirements. These are chiefly of a very primitive type and notable as a matter of individual taste and convenience rather than for any other particular characteristic. The economic life of many ranges having been passed, most of the estates have found it necessary to undertake a policy of replacement. In some it has been possible to rehouse the labourers in simple standardised cottages owned and built by the estates, or in cottages erected with the financial assistance of the management on land owned by the estates.

There are social advantages to this type of housing which cannot be gainsaid but there are epidemiological factors associated with the Colony's most prevalent disease, malaria, which tend to discount their merits in some areas. Unquestionably, this type of housing is the more expensive to build and maintain and whether or not it can be borne by the industry is beyond the limitations of this statement. The erection of new "ranges" has been authorised within restrictive specifications by the Central Board of Health under a policy formulated and in operation since 1936.

These restrictions in brief require greater spacing between ranges than was formerly required, a greater elevation from the ground level, and the limitation of occupation to a maximum of 10 family units per range. More recently and without definite obligation, some of the estates have seen fit to improve on these minimal requirements by way of providing attached individual kitchens, reducing family units per range to six, and improving partition arrangements to afford greater family privacy and more satisfactory individual ventilation of the family units.

185. Although there has been natural reticence on the part of some estate managements to the unaccustomed inter-position of the Government Public Health Authorities in the construction programmes on the estates, it must be acknowledged that the general co-operation in this respect is in advance of the benefits which the health authorities are in a position to afford the estates.

186. *Water Supplies.*—With the exception of a single water-treatment plant at Plantation Albion and the artesian water sources as summarised in the attached table, there are no safe water supplies on the coastal belt of the Colony. Georgetown and New Amsterdam are provided with piped water. The former has its source from a large uninhabited area known as the Lamaha Catchment Reserve from which the water is conducted through an open canal to the pumping station at the edge of the city. This water is no doubt satisfactory for purposes of sewage disposal, fire protection, and factories, but as an untreated raw water it cannot be considered safe for domestic consumption. The source of the New Amsterdam piped water supply is the Canje Creek. This is a tidal river into which the faecally contaminated drainage of Plantation Rose Hall empties. On account of the tidal character of this river the town's inlet is liable to fouling. An open canal of about five miles in length conducts the water to the pumping station about two miles outside the town. The pumping well here being unprotected, the town's water is almost invariably heavily silted with a muddy suspension. Since this town is not sewered the purpose of this water supply may be suitable for fire-protection, but it can by no means be considered as safe for domestic purposes.

187. In consequence of these circumstances water supplies of all but the poorest classes are derived from domestic rain water reservoirs of usually unsatisfactory design. These and their ancillary gutterings in a great proportion are so inadequately maintained that the domestic breeding of the species of mosquito concerned with the transmission of yellow fever and dengue is a permanent hazard. It is not known to what extent this type of water is subjected to boiling before consumption, but it is believed that this is an exceptional practice. Roofs in urban centres of population cannot be considered safe catchment areas.

188. For persons whose dwellings are without adequate reservoir accommodation, drums, buckets, etc., serve as temporary expedients with all the mosquito-hazard inherent in them, and when these fail, rain water may be obtained from large, usually well-constructed reservoirs associated with public buildings and under the control of the local authorities (in extra-urban areas these may be controlled by the Public Works Department).

189. The Pure Water Supply Scheme for the Colony which in 1931 first had the assistance of a grant from the Colonial Development Fund is being carried out by a special engineer under control of the Public Works Department. This is un-

doubtedly one of the most important public health measures yet undertaken in the Colony.

190. The scheme provides for the installation of artesian water supplies along the closely populated coastal belt. By the end of 1938, 69 artesian wells have been constructed and from many of these piped water has been carried to neighbouring communities. The attached table shows the distribution of these wells to the end of the year under review.

191. Some objection has been raised to the water on account of its high mineral content but this is being gradually overcome and aeration methods to obviate this have been used in many instances.

192. Elsewhere in the Colony not previously noted, domestic water supplies are entirely uncontrolled, perhaps with safety in the thinly populated areas. Rain water reservoirs serve those who can afford such. Improvised equipment from old sugar factories serve this function for some. Discarded oil and cement drums, etc., serve the immediate needs of the improvident, the poor, and the careless, who must therefore obtain most of their domestic water from the so-called "sweet water" trenches, ditches and ponds. The hazard of this situation is patent in the communities on the coastlands. It is negligible in the interior where rivers, creeks and streams are the sources of supply to a very sparse population who often exhibit a natural concern for their water supplies.

TABLE LI.
WATER SUPPLIES—ARTESIAN WELLS.

Country Area.		Public.	Private.	Total.
DEMERARA.				
West Coast	...	8	3	11
West Bank	...	4	1	5
East Bank	...	2	3	5
East Coast	...	12	3	15
Georgetown	...	2	...	2
Total	...	28	10	38
BEBBICE.				
West Coast	...	6	...	6
West Bank	...	2	...	2
Corentyne	...	11	2	13
New Amsterdam	...	1	...	1
Total	...	20	2	22*
ESSEQUEBO	...	9	...	9
Grand Total	...	57	12	69

* 6 of these will be reconditioned during 1939.

193. *Drainage.*—As stated in the previous Annual Report, the importance of adequate drainage along the coastlands of the Colony can hardly be overestimated. The most prominent disease in the Colony, *i.e.* malaria fever, must for its prevention depend first and foremost on effective main drainage of the land. Again, where the type of latrine in village and rural areas remains that of the dry pit system, the height of the subsoil level of the water becomes of first importance. Within comparatively recent years the introduction by estate authorities of powerful pumps at intervals along the coastlands of estates has had the effect of enabling such lots to be utilised for building purposes, whereas front lands were formerly flooded with water from aback; now buildings are rapidly going up on land that, as a whole, is fairly well drained and laid out.

194. It is hoped, however, that it may be possible in the near future to tackle radically the drainage question throughout the coastlands of the Colony as a major scheme which, if for no other reason, would be well worth while from the standpoint of the prevention of malaria.

195. *Sewage Disposal*.—Georgetown is the only place in the Colony with a water-borne sewage disposal system. Elsewhere various unorthodox types of septic tanks serve the more affluent householders and public buildings. The inadequately sedimented effluent from these is discharged into the open drains of New Amsterdam, and into any convenient water-course elsewhere. Over-trench latrines as a rule serve the sugar estates. Where convention or the influence of the Public Health Department has weight, a boxed-mound pit latrine has met acceptance. In communities that are flooded during the wet season and elsewhere the primary conventions are disregarded. It must be borne in mind that this whole problem on the low-lying coast lands is beyond ordinary solution as a consequence of the high water table, insoluble drainage problems, and the generally poor absorptive character of the soil.

196. *Trades and Industries*.—Control of the establishment of offensive trades has been maintained throughout the year, the greatest number of applications dealt with still being requisitions for the establishment of factories for the manufacture of coconut oil.

197. The usual inspection of rice factories was carried out during the last quarter of the year. It has not yet been found possible to bring into force regulations governing trades and industries, enabling power for which exists in the Public Health Ordinance, No. 15 of 1934. Indeed, generally, the question of drafting regulations is combined to some extent with what has been stated above in relation to overburdening and shortage of the sanitary staff as the effectual carrying out of such regulations must still further increase their duties, and whilst not a few of such regulations are in draft, they have not further been proceeded with partly upon these grounds.

SPECIAL PREVENTIVE MEASURES.

198. *Milk Testing*.—The testing of samples of milk was continued more or less throughout the year, the object being to ascertain over a large number of samples, the quality of milk being produced in the Colony. Preliminary analysis has shown marked and steady deterioration in the milk as collected directly from the cow into sterilised receptacles and that as retailed to the consumer.

199. The whole question of the milk supplies of the Colony is now under examination and also the position as regards contractual supplies to medical and other Government institutions.

200. Inspection of cattle-byres by sanitary inspectors is regularly carried out and requirements in accordance with the existing by-laws on the subject are enforced as far as possible. In certain areas the extreme poverty of the people makes this very hard of achievement.

201. Whilst drastic action at this juncture which would have the effect of throwing out of employment many hundreds of these small producers hardly seems warranted, the production of wholesome and controlled milk supplies must nevertheless remain a problem to be solved at the earliest possible date.

202. *Bonification*.—Work continued on the Thomas Lands in Georgetown and upon a limited area on the Fort Lands between the Mental Hospital and New Amsterdam.

203. *Other Sanitary Works*.—Financial assistance was extended to New Amsterdam in reclaiming a section of the market area. A contribution was made to the permanent drainage programme of the Local Sanitary Authority at Bartica. Assistance was continued in erecting new latrines for schools, and various small bonification works were undertaken in connection with several Government compounds outside the two urban sanitary districts.

204. *Village Sanitation*.—Under the existing form of local government this is

the statutory duty of the local sanitary authorities. In urban, village and country sanitary districts, the local authorities are the *de jure* local sanitary authorities. In rural sanitary districts the Local Government Board and the Central Board of Health separately are charged with the responsibility under this head.

205. Village and country authorities, from the viewpoint of sanitation, are frequently indistinguishable. Not all declared village and country districts continue to operate as local authorities; all sugar estates and some other settled communities continue to be rural sanitary districts. The objective of the Government Public Health Department is to have trained sanitary inspectors operating as officers of each functioning local sanitary authority. This objective has not yet been attained. Except in the urban sanitary districts, both of which have Public Health Departments, the sanitary inspectors are employees of the Government Public Health Department. District work frequently involves connection with several local sanitary authorities and responsibilities in connection with the intervening rural sanitary districts. The last of these for obvious reasons are admittedly not under satisfactory control.

206. Where a sanitary inspector serves a local sanitary authority it is his responsibility to carry on the statutory public health activities subject to the statutory governing body, and to serve as liaison between that body and his County Health Officer who advises the authority on behalf of the Central Board of Health. Problems of both an economic and hydrographic nature preclude notable progress in village sanitation, but slow and gradual improvement is being effected. Aside from these factors the executive difficulty of local public health administration is the establishment and maintenance of reasonable sanitary standards. Vacillations in policy must necessarily arise in proportion as local authorities may fail to appreciate and effect improvements in standards or as sanitary officers fail in their duty to advise on these matters. The persuasion of individuals to improve the sanitary state of their immediate surroundings must necessarily be vitiated unless local authorities have an equitable concern that such improvements should have general application to the whole community under their charge.

207. The general experience is that since village sanitation requires co-operative effort involving either the expenditure of money or the undertaking of an unaccustomed personal activity, it is therefore not popular and tends to be shelved until financial or executive assistance is forthcoming from the central authority. The exercise of discretion with a pious hope that popular public health education will effect a change in human nature, for a number of years has offered a convenient diversion of responsibility.

208. *Yellow Fever*.—With the recognition of the possibilities of the introduction of the jungle variant of this disease to the populated sections of the coastlands special precautionary and investigative measures were undertaken as noted elsewhere in this report.

209. *Active Immunization*.—Limited supplies of the attenuated virus (17 D) were made available by the Laboratories of the Rockefeller Foundation at Rio de Janeiro. General immunization was not undertaken, but groups of volunteers particularly those liable to exposure in the interior were afforded the opportunity to take advantage of this means of personal protection at the Public Hospital, Georgetown. No adverse effects were reported from the injection of this material. It was not possible to check the extent of immunity acquired by this measure, but of the limited number of sera checked after immunization, none failed to show evidence of an immunity response although there was a variation in the protection-test levels attained.

210. *Aedes aegypti control*.—Experience in the coastal settlements indicates that no serious concern is shown towards the control of *aedes aegypti*. For that

reason a survey of the aedes larval index was undertaken in all districts where sanitary inspectors were operating. Since the authority of the urban sanitary district of Georgetown intimated preference to undertaking these activities independently, Government contributed half the costs of employing six extra temporary inspectors for a period of three months to undertake a survey. Reports indicate that efforts directed towards controlling this problem reverted to the routine measures followed prior to the survey. It cannot be doubted that if a pure water supply were available to Georgetown there would remain no reason for the storage of rainwater for domestic purposes, and a significant reduction in aedes production should automatically ensue. The potentialities in Georgetown, however, will not be entirely eliminated by this desirable improvement until the householders are made to be fully conscious of the fact that the control of this mosquito is a domestic problem and not a municipal service.

211. Three temporary inspectors were taken on the strength of the Government Public Health Department for survey purposes in the Port of Georgetown, Government premises in Georgetown, and the districts comprising the environs of Georgetown. This covered a period of three months. All inspectors of the Department were under instruction to make a survey in the districts under their charge. At the expiration of the survey local sanitary authorities were advised to institute punitive proceedings against persistent defaulters insofar as the domestic breeding of aedes aegypti was concerned. Monthly reports on findings, the institution of proceedings, and the correction of the contributory defects have been submitted since the commencement of these activities.

212. From the initial surveys the following aedes (larval) indices were obtained:—

Place.	No. of premises Inspected.	Aedes Index.
Government Compounds.		
Georgetown	... 62	53.2
New Amsterdam	... 17	29.4
Suddie	... 13	53.0
Port of Georgetown	... 41	12.2
Urban District of Georgetown	... 1,499	44.7
Urban District of New Amsterdam	... 745	26.3
County of Berbice	... 777	27.5
County of Demerara	... 4,387	34.2
County of Essequibo	... 1,423	22.6

213. *Internal Air Traffic.*—A single machine operated out of Georgetown on contract to the Boundary Commission. A certain limited number of other contract flights were undertaken to the Rupununi and Essequibo districts. The owner, who operates the machine, was fully informed of the potential hazard through his contact with the suspected areas, and co-operated in keeping the Medical Department informed of all passenger traffic arriving in Georgetown by this means of transport. All ground and flying personnel submitted to immunization. Forms based upon those used by the Pan-American Sanitary Bureau were supplied for record purposes.

V.—PORT HEALTH WORK AND ADMINISTRATION.

PORT OF GEORGETOWN.

214. During the year the visiting of vessels and granting of pratique were performed by the Deputy Port Health Officer.

215. Quarantine was maintained during the year as follows:—

(a) Permanently against all South and Central American ports (except British, French, and Dutch) for yellow fever, plague, small-pox, cholera, and typhus fever.

(b) Against the ports of New Orleans, Mobile and Tampa (U.S.A.) for typhus fever.

(c) In the case of ships coming from St. Thomas, St. Croix, Porto Rico and Santo Domingo, arrangements are in force to ensure the notification of any occurrence of quarantinable disease in these ports.

216. *Vessels visited by the Port Health Officer.*—During the year 141 vessels were visited by the Port Health Officer under the Quarantine Ordinance tabulated as under with fees chargeable in each case :—

Month.	Gratis.	\$4 00	\$6 50	\$9 00	\$5 00 Fumigation.	\$2 00 (Revisit).
January ...	...	10	...	...	...	...
February ...	...	8	1	...	...	...
March ...	1	12	1	...	...	...
April ...	...	13	...	1	...	...
May ...	...	12	...	...	...	...
June ...	...	12	2	1	...	...
July ...	...	12	...	...	...	...
August ...	...	12	...	...	1	...
September ...	...	9	1	...	...	...
October ...	...	9	...	...	...	...
November ...	...	10	...	...	...	...
December ...	2	12	...	...	...	...
Total ...	3	\$524	\$32 50	\$18	\$5	Nil.

217. Passengers were placed under surveillance by the Port Health Officer as follows :—

For small-pox	...	...	...	15
For cholera	...	...	...	Nil.
For yellow fever	...	...	...	Nil.
For plague	...	...	...	Nil.
For typhus	...	...	...	Nil.

218. Vessels consigned to the Demerara Bauxite Company, McKenzie, Demerara River, with crews were placed under surveillance by the Port Health Officer and were allowed to proceed to their destination. In each case the Medical Officer of the Bauxite Company was instructed to keep all members of the crew of each vessel under surveillance until the quarantine period had expired, and to report at the expiration of the period.

219. *Vessels visited by the Port Sanitary Inspector.*—The total number of vessels visited was as under :—

	Steamers.		Sailing Vessels.
Ocean Steamers ...	183	Schooners	298
Coasting Steamers	37	Other Crafts	195
Total	220	Total	493

220. The total number of visits paid to vessels was as follows :—

	Steamers.		Sailing Vessels.
Ocean Steamers ...	269	Schooners	364
Coasting Steamers	258	Other Crafts	321
Total	527	Total	685

221. The above visits include routine inspection of Government steamers.

222. *Notices served on Masters of Vessels lying in Port* :—During the year no notices were served on Masters of vessels by the Port Sanitary Inspector. Nuisances occurring on board vessels were abated according to verbal instructions issued.

223. *Care of Merchant Seamen*—52 sick seamen were sent to the Public Hospital, Georgetown, for treatment during the year from ocean-going vessels.

224. *Vessels fumigated and disinfected by the Port Health Authorities.*—1 schooner was fumigated during the year. Plague precautions were enforced on vessels lying alongside the Port of Georgetown or at McKenzie, Demerara River.

225. *Disinfection and Fumigation Machines.*—

(1) *Clayton Fumigation Machine at the Public Hospital, Georgetown.*—This machine was not employed for fumigation purposes during the year but was subjected to a quarterly test and gave satisfaction on each occasion.

New hose for this machine is required.

(2) *Washington Lyons Steam Disinfector at the Quarantine Station, Best, West Coast, Demerara.* Four mattresses were disinfected in this machine on the 15th of September, 1938. It is in good working order.

226. *Clayton Rat-Gassing Machine.*—This machine was used in the fumigation of the hold of the schooner "Golden West" on the 29th of July, 1938. It worked satisfactorily.

227. *Trapping and Extermination of Rats.*—53 rats were trapped during the year and post-mortem examinations made. No disease was found.

228. *Quarantine Station, Best, W.C. Demerara.*—Regular attention has been directed to the keeping of this station compound in a sanitary condition, including the weeding of grass, bushing and the maintenance of proper drainage.

229. *Remarks.*—Cablegrams were interchanged as heretofore between the Health Officer of this and other convention ports giving notice of passengers under surveillance on board vessels about to sail.

230. The total amount of revenue accruing to Government from sanitary measures in the Port of Georgetown in 1938 was \$579.50.

231. No shrimping was carried out in the prohibited area of the Port of Georgetown.

VI.—INFANT WELFARE AND MATERNITY.

232. Infant Welfare and Maternity work in the Colony operates under the control of The Infant Welfare and Maternity League which had its origin under the name of the Baby Saving League in 1914, with a staff consisting of a Lady Superintendent, a Secretary, four midwives working in Georgetown and three midwives working in the country. The precursor of this organization was the Children's Protection Society which first became active in 1890. In 1924 the name, Baby Saving League, was altered to that under which the League now operates. During that same year the Town Council of Georgetown assumed the management of the crèche and the infant and maternal welfare work within the municipality: the remainder of the field elsewhere in the Colony became the responsibility of the League. For reasons that are by no means clear the division of responsibility has involved a separation under which circumstances the record of the Georgetown activities will be found in the report of the Medical Officer of Health for that Municipality.

233. Upon the commencement of the Baby Saving League a grant-in-aid of \$2,000 was made by Government. With the re-organization in 1924, Government Grants totalling \$16,886 were allocated to this work, of which \$4,800 was directed to the Georgetown crèche and the residue covered the operations of the League elsewhere. At that time there was a staff of thirty-eight midwives. In 1938 the subvention from Government amounted to \$13,324, an increase of \$520 over that of 1937 which was granted to provide for the increase in drugs and equipment. During the fiscal year the field staff consisted of two Inspectors of Midwives, eight health visitors and thirty-eight subsidised midwives.

234. Except in the case of necessitous persons, attendants at the clinics are expected to become members of the League upon the payment of a shilling. Membership consists of expectant mothers and the infants born to them, as well as other infants whose mothers have failed to take advantage of the available pre-natal facilities. From this source a sum of \$233.54 was collected. Where branch committees are organised it was decided during this year that one-half of such fees obtained from their respective clinics were to be retained by the branch committees to assist in the branch activities of providing milk and other necessary relief for needy mothers under their supervision. This form of assistance for clinics outside the ægis of branch committees is forthcoming upon the recommendation of the Inspectors of Midwives to the Central Committee.

235. *King George V. Silver Jubilee Fund.*—The sum of \$2,141.57 was expended by the end of the year, \$200 of which was allocated to the Georgetown Maternity and Child Welfare Centre to equip a test weighing clinic. Couch-cabinets were installed in 18 League clinics. These cabinets are considered to have met an outstanding need of privacy and convenience at centres which were never designed for this purpose. Accommodation at some of the centres is so limited that it is not even yet possible to find space for these couch-cabinets.

236. *King George V. Silver Jubilee Maternity Home, Ida Sabina.*—The work on the Upper Berbice River district through this Maternity Home has continued to serve as a very useful centre of the League's activities amongst the Aboriginal Indians and the settlers in this area. The League midwife who resides on the compound conducted 25 deliveries at the home during the year, and with the co-operation of the Government dispenser conducted pre-natal and infant clinics at the various points which are regularly served up and down the river. Although it has not been possible to arrange for visits by Government Medical Officers during the year, the Inspector of Midwives for the County of Berbice undertook two visits each of about five days during the year whereby she was enabled to visit a number of the clinics, give health talks, and make personal contact with the mothers of the district. One of the chief problems affecting this area is to find a midwife who by disposition and temperament can accommodate herself to the isolation and at the same time obtain the confidence of the people who are to be served. To a person whose previous career has been restricted to the conditions found on the coastlands, location at Ida Sabina requires a physical and mental adjustment that is not common, and as such it may be necessary to contemplate the recruitment and training of a suitable person from the younger residents of the area. Arrangements are being made to have this centre visited from time to time by a medical officer.

237. *Clinics.*—Clinics were conducted by Government Medical Officers within their districts, and in the more remote areas by Government dispensers where supervision and advice are given to expectant mothers, and regular examination with medical treatment where necessary to infants, 58 such clinics were so conducted, exclusive of those on the sugar estates.

238. Although it has not been possible to finance the appointment of a League midwife at Crabwood Creek, Corentyne, the Government Medical Officer, Springlands, has continued to conduct regular clinics with the assistance of a private midwife resident in that vicinity.

239. Opportunity arose in May to discontinue the subsidy of a midwife at Bartica where it has been possible to continue the clinic at the public hospital with the voluntary assistance of the members of the Branch Committee. The League's declared policy to employ full-time health visitors as re-adjustments permit was put into effect in this instance to finance such an appointment to the East Bank of the Demerara River, where the withdrawal of a League midwife created an opening for the appointment of the League's eighth health visitor.

240. Supervision of the activities of the League health visitors and League

midwives in particular, and practising midwives in general, was in charge of two Inspectors of Midwives, one for Counties of Demerara and Essequibo and the other, Berbice. Clinic centres were frequently visited by these Inspectors who made inspections of the kits and registers of the League and private midwives. While these officers are in a position to report defaulting midwives to the Medical Board it is considered that considerable strengthening of this phase of their activities is in need of consideration by that Board.

241. While the activities of the Infant Welfare and Maternity League are published separately, the following extract may be quoted here :—

“His Excellency the Governor, Sir Wilfred Jackson, K.C.M.G., and Lady Jackson honoured the League by consenting to give their distinguished patronage.

“The Central Committee was strengthened in the acceptance of membership of His Lordship the Bishop of Guiana (the Rt. Revd. Alan John Knight) and Mrs. C. Farrar. The resignations of Dr. B. N. V. Wase-Bailey and Mrs. Wase-Bailey are recorded upon transfer from the Colony. The withdrawal of these members cannot pass without acknowledging the valuable services rendered by both of them, particularly Dr. Wase-Bailey who served the League over a period of 10 years, from 1931 as Vice-President and latterly as President in his capacity as acting Director of Medical Services.

“Dr. Norman M. Maclenman, Director of Medical Services, upon appointment assumed the office of President, and Dr. P. A. T. Sneath, upon assuming duty as acting Government Medical Officer of Health, was appointed a Vice-President, *vice* Dr. B. N. V. Wase-Bailey.

“The executive work of Secretary-Treasurer was faithfully carried on by Miss E. Lewis in addition to her substantive duties in the Government Public Health Department until the end of May when Miss G. Lewis was appointed to take over these responsibilities on a part-time basis.

“From the statistical tables it will be observed that the Colony's infant mortality rate of 166 per 1,000 births is the highest since 1934 wherein the racial groups most seriously affected were the East Indian, Black, Mixed and Portuguese. The reason for this can be stated to be associated with epidemic malaria (particularly in the County of Berbice) and the acute incidence of respiratory infections in the Colony at large. This general experience is reflected in the return of deaths of clinic infants. League midwives delivered 2,141 living infants, approximately 21 per cent. of all the infants born in 1938, the same proportion as for 1937. Of these 110 died—an infant mortality rate of 51.3 per 1,000 in contrast with the Colony's experience of 166 per 1,000 live births. There were 18 deaths of mothers amongst this group, a maternal mortality rate of 8.4 per 1,000 births compared with the Colony's maternal mortality rate of 15.2 per 1,000 births. Both these rates are in excess of the League's experience in 1937, when the infant mortality rate and maternal mortality rate were respectively 22.5 and 6.4 per 1,000 births. This adverse state of affairs cannot be viewed with any degree of satisfaction.

“Although health conditions as indicated by the Colony's vital statistics in 1938 are notably adverse, and the deliveries conducted by the League midwives must necessarily be related to the birth rate, there is evidence that there has been a significant decline in the proportion of cases conducted by League midwives since 1934. It is not possible to know the explanation of this, nor is it necessarily desirable that subsidised midwives should be expected to obtain a greater proportion of the remunerative midwifery cases than obtains at present, in view of the number of midwives registered with the Medical Board. Although the League may view with some degree of pride the fact that the general trend of infant mortality is decreasing, there is no evidence over the past fifteen years that

“ much effect has been made upon the abnormally high maternal mortality rate in this Colony. The efforts of the successors to the Baby Saving League have met with a modicum of success over twenty-five years. Until the additional activities implied by the change of the League’s name in 1924 have made a greater impression on the Colony’s maternal mortality the League has not yet fulfilled its dual purpose.”

242. Maternity and Child Welfare Work on sugar plantations has continued to make progress. Clinics are conducted by Government Medical Officers and estate medical officers, nurses and midwives. Twenty-two estate hospitals, namely Skeldon, Albion, Port Mourant, Rose Hall, Providence (Berbice), Blairmont, Bath, Cane Grove, Non Pareil, Enmore, Lusignan, La Bonne Intention, Vryheid’s Lust, Ogle, Providence (Demerara), Farm, Diamond, Wales, Versailles, Leonora, Uitvlugt and DeKinderen have maternity wards where confinements are conducted by midwives employed by the Estate Authorities with the assistance of similarly employed dispensers, both under the supervision of the Government Medical Officers.

243. There are maternity wards in each of the five principal hospitals of Georgetown, New Amsterdam, Suddie, Maburuma and Bartica.

244. The accommodation in the public hospitals and maternity returns for 1938 are shewn in Table LII. ;—

TABLE LII.

Place.		Number of Beds.	Deliveries.	Deaths (Maternal).	No. of Births.	No. of Still-births.
Public Hospital,	Georgetown	46	973	30	863	91
do.	Berbice	8	206	18	209	36
do.	Suddie	12	111	9	111	20
do.	Mabaruma	2	34	...	33	1
do.	Bartica	*	26	1	24	2

* There are 19 beds in the female ward which are available for maternity cases.

Returns in respect of the Infant Welfare and Maternity League in 61 Centres.

Districts.	Government Medical Officer.	No. of Clinics.	NO. ATTENDANCES OF INFANTS.		No. Infants Treated.	EXPECTANT MOTHERS.	
			Under 1 year.	Over 1 year.		No. Attendances.	No. Treated.
Lodge	Dr. S. K. Mangal	12	187	32	49	39	6
Kitty	Dr. J. E. R. Ramdeholl	25	1,055	119	241	229	71
Plaisance	do.	24	257	110	81	37	14
Betervervagting	do.	24	318	76	130	31	6
Buxton	do.	23	322	92	52	20	0
Paradise	Dr. G. T. G. Boyce	12	184	124	96	14	0
Golden Grove	do.	12	289	176	123	13	0
Victoria	do.	12	136	66	75	12	0
Ann's Grove	do.	11	196	63	77	0	0
Unity	do.	12	57	28	34	0	0
Mahaica	do.	10	67	25	24	8	0
Supply	do.	12	30	20	25	6	0
De Kinderen	Dr. F. A. Viapree	12	68	7	8	0	0
Mahaicony	do.	12	93	6	34	5	0
Airy Hall	do.	12	101	7	63	1	0
Belladrum	do.	19	179	1	56	120	9
No. 28 Village	{ Dr. C. C. Nicholson Dr. G. A. Grandsoult	9	39	7	17	6	5
Hopetown	do.	2	29	11	17	3	2
No. 9 Village	do.	18	195	36	59	42	8
Rosignol	do.	18	136	29	67	52	20
Adelphi	{ Dr. G. E. Carto Dr. N. J. Abbensetts	17	85	33	50	27	17
Sheet Anchor	Dr. G. W. Mearns	9	132	2	39	142	110
Sisters	do.	10	91	71	72	7	4
Sandvoort	do.	16	80	70	60	58	50
New Amsterdam	do.	49	856	48	308	923	751
Berbice River	Govt. Dispenser	68	201	115	69	58	6
Mara	Dr. K. Singh	7	40	6	35	15	3
Fyrish	Dr. L. R. Sharples	10	168	3	30	51	6
Rose Hall	do.	12	277	4	49	109	11
Bloomfield	do.	12	396	6	64	139	20
Limlair	do.	12	393	0	54	91	19
Nos. 49 and 50	Dr. C. R. Subryan	2	13	0	0	6	0
No. 64	do.	27	212	26	77	55	4
Nos. 78 and 79	do.	7	176	27	76	39	28
Crabwood Creek	do.	3	17	14	31	4	3
La Penitence	Dr. G. M. Kerry	24	640	133	197	177	54
Agricola	do.	24	260	115	83	151	17
Grove	do.	18	57	7	23	22	7
Vreed-en-Hoop	Dr. J. Nedd	14	94	27	36	44	9
No. 1 Polder	do.	19	50	24	41	19	12
Bagotville	do.	12	113	24	46	43	18
Good Intent	do.	16	94	16	23	55	4
Windsor Forest	Dr. R. N. Cozier	14	32	7	10	2	0
Den Amstel	do.	16	105	29	28	29	4
Hague	do.	11	77	35	21	1	0
Parika	do.	12	44	23	19	0	0
Leguan	do.	12	119	39	39	26	21
Marionville	Govt. Dispenser Simon	18	184	122	88	52	27
Zeelandia	do. Dash	22	147	85	105	27	11
Aurora	Dr. E. W. Reece	25	103	2	48	15	15
Riverstown	do.	25	246	143	135	44	26
Suddie	do.	26	382	153	149	19	8
Queenstown	{ Dr. C. Ramdeholl Dr. Mook-Sang	21	91	49	61	39	16
Anna Regina	{ Dr. C. Ramdeholl Dr. Mook-Sang	24	447	133	192	100	58
Danielstown	do.	23	112	63	57	34	27
Charity	do.	24	258	95	156	109	68
Moruca	Dispenser Rodney	24	338	231	254	9	4
Bartica	Dr. W. D. Pollard	24	344	168	64	34	9
Morawhanna	{ Dr. W. W. Besson Dr. L. H. Wharton	22	151	48	75	23	5
Total	...	1,021	11,564	3,325	4,292	3,436	1,573

VII.—SCHOOL MEDICAL AND DENTAL SERVICES.

245. *Medical*.—No regular school medical inspection is undertaken. In 1931 a medical survey was made at Queen's College. The findings from this inspection of 167 boys of secondary school age may be summarised as follows:—

Defects found.	No.	Percentage.
Defective vision	26	15.5
Dental caries	82	49.
Diseased tonsils	81	48.5
Splenic enlargement	3	1.8
Inguinal adenitis	5	3.0

Average of 1.14 defects per boy.

246. Upon request of the Principal, an officer of the Government Public Health Department has made intermittent inspections of this character since that time. Recommendations relative to the correction of the defects found have been forwarded to the Principal for the consideration of the parents.

247. A determination of splenic indices on school children by Government Medical Officers on estates and elsewhere appears to have been left to the initiative of the officers themselves. A school medical inspection service is therefore entirely lacking.

248. *Dental*.—An inadequate service to the schools in Georgetown and New Amsterdam has grown out of the appointment of dentists to the respective public hospitals, commencing in Georgetown in 1924 and in New Amsterdam in 1936. The clinics thus established at the hospitals in point of fact operate chiefly as extraction clinics for persons in possession of "poverty" or "pauper" certificates from the Poor Law Commissioners and such dental work as may be necessary on a similar type of hospital patient admitted for other or related causes.

249. While these dental surgeons were employed with the understanding that they should undertake the dental inspection of school children and the delivery of lectures on oral hygiene, the volume of other work in the clinic precluded any serious undertaking of the latter nature.

250. In 1931 a survey of 829 school children (389 males, 440 females) was made in five primary schools in Georgetown, the findings from which are summarised below. There has been no similar survey made elsewhere. In 1932 an extension of this survey was made covering five additional primary schools, when 503 school children (281 males, 222 females) were examined.

251. Summary of dental defects found in survey of five primary Schools, Georgetown:—

1931.

Defects.	No. of Pupils.		Total.	No. of Defects.
	Male.	Female.		
Dental Caries ...	327	387	714	3,206
Gingivitis ...	34	43	77	77
Stomatitis ...	4	...	4	4
Pyorrhœa ...	...	2	2	2
Total ...	365	432	797	3,289*
Per cent. (All pupils)	91	98	96	

* No. of carious teeth per defective mouth 4.6.

1932.

Defects.	No. of Pupils.		Total.	No. of Defects.
	Male.	Female.		
Dental Caries ...	239	194	433	1,741
Gingivitis ...	12	8	20	20
Stomatitis ...	...	...	...	...
Pyorrhœa ...	1	...	1	1
Total ...	252	202	454	1,762†
Per cent. (All pupils)	93.2	91.2	90	

† No. of carious teeth per defective mouth 3.98.

252. In 1933 two part-time School Dental Officers were appointed in Georgetown, payment being upon a fixed schedule of the work done. In 1937 a similar arrangement was made for the primary schools in New Amsterdam.

253. The existing arrangements are essentially as follows :—The Director of Education selects the schools at which the dentists may make their initial surveys. The pupils requiring attention are selected and directed to attend the dental clinic operated by the officer concerned with a school teacher. At the time of the initial inspection, a talk on oral hygiene is given by the dentist. It follows that all the dental defects occurring in any one school must be disposed of before the dentist directs his attention to another school. To serve “emergency” cases arising in the other schools, the headmaster, upon his own judgment, may refer such a case direct to the dental clinic without the dental surgeon having previously seen the patient. This type of case usually involves extraction. The amount of prophylactic work accomplished is dependent upon the advanced state of the diseased conditions, and under the present arrangements, tends to constitute the lesser proportion of the work undertaken.

254. During 1938 school dental work was carried out as usual as follows :—

A sum of \$1,680 was voted on the 1938 Estimates—\$960 for the dental treatment of children attending primary schools in Georgetown, \$480 for children in New Amsterdam and \$240 for children in Kitty Village, East Coast, Demerara.

255. The clinics were conducted by Dr. H. Whyte Cameron and Dr. J. L. S. Murray, Dental Surgeons, in Georgetown, and Dr. G. M. Gonsalves in New Amsterdam. During the year a clinic was begun at Kitty Village. This clinic was conducted by Dr. H. Whyte Cameron every Friday at the pavilion of the Kitty playground.

256. In Georgetown the two dental surgeons held clinics every school day throughout the year. 1,461 children (615 boys and 846 girls) from 19 schools received treatment at these clinics.

257. Treatment was either complete, or that which is given in cases of emergency. The former category, in addition to extractions, prophylactic treatment and various types of fillings, included dental abscess and root canal treatment. Each dental surgeon devoted his attention to one school at a time and on its completion proceeded to another school. 553 children (240 boys and 313 girls) from four schools received complete treatment. The schools were—Kingston Methodist, Werk-en-Rust Methodist, Wortmanville Roman Catholic, and Charlestown Roman Catholic.

258. The work done at the schools was as follows :—

By Dr. Cameron—

Prophylactic treatment	...	... 206
Extractions	...	... 339
Amalgam fillings	...	... 92
Cemet fillings	...	... 23

By Dr. Murray—

Prophylactic treatment	...	... 71
Extractions	..	... 560
Amalgam fillings	...	... 118
Procelain fillings	...	... 14
Cement fillings	...	... 2
Gutta Percha fillings	...	... 2
Root canal treatment and temporary filling	...	... 1
Abscess attendances	...	... 26

259. Emergency treatment consisted mainly of extraction. 908 children (375 boys and 533 girls) were treated from the following schools—Ursuline Convent Roman Catholic, Main Street Roman Catholic (Girls), Queenstown Roman Catholic, St. George's Anglican, St. Barnabas's Anglican, Bourda Roman Catholic, Bedford

Methodist, St. Philip's Anglican, St. Stephen's Church of Scotland, St. Sidwell's Anglican, Lodge Congregational, Freebrug Anglican, Smith Congregational, St. Mary's Roman Catholic, St. Andrew's Church of Scotland.

260. The schools treated in New Amsterdam were All Saints Church of England, All Saints Church of Scotland, Congregational and St. Therese's Roman Catholic. 493 children (243 boys and 250 girls) were attended to.

261. The work done was as follows :—

Extractions	...	...	362
Prophylactic treatment	...	...	10
Amalgam fillings	...	...	442
Emergency extractions	...	...	205

262. 174 children (84 boys and 90 girls) from St. James the Less Anglican School, Kitty, attended the clinic in this village.

263. The work done was as follows :—

Prophylactic treatment	...	...	130
Extractions	...	...	233
Amalgam fillings	...	...	65
Cement fillings	...	...	23
Emergency extractions	...	...	2

264. The reports from the school dentists indicate that on the whole the School Dental Scheme continues to be highly appreciated both by pupils and parents.

VIII.—NUTRITION.

SUMMARY OF WORK DONE BY THE STANDING COMMITTEE ON NUTRITION.

265. This Committee was appointed on 27th July, 1936, and under the terms of appointment submitted a report which was published in 1937 (under the reference Legislative Council No. 3/1937, C.S.O. No. 2902/35).

266. *Experimental Group of School Children.*—Commencing on 4th April, 1938, one hundred and ninety-two "healthy" school children were medically examined, of whom ninety-six were Negroes and ninety-six East Indians. Each group was made up equally of males and females and of three age periods, viz., 6-7, 9-10, and 13-14 years.

267. The result revealed the presence of—

- (1) Enlarged spleen in 18.7% of all cases, 10.4% in Negroes, and 27.8% in East Indians.
- (2) Hookworm infestation in 4.7% of all cases, 2.1% in Negroes, 7.3% in East Indians.
- (3) Ascaris infestation in 20.6% of all cases, 24% in Negroes, and 29.2% in East Indians.
- (4) Haemoglobin percentage ranging from 85 to 60 with an average of 73.7 in all cases, range in the Negroes being 85—60 with an average of 74.8.
- (5) Defects due to a deficiency of accessory food factors were found in 6.7% of all cases, 9.3% in Negroes, and 4.1% in East Indians.
- (6) Skin lesions of all kinds were noted in 25% of all cases, 27% in Negroes, and 22.9% in East Indians.
- (7) Dental caries in 63.5% of all cases, 64.5% in Negroes and 62.5% in East Indians.
- (8) A relatively high incidence of hypopigmentation of the skin in patches was noted more especially around the area of the nose, upper lip and above the eye, although they were found to be distributed over the chest and back in some instances. This condition seems to be more prevalent in the Negroes than in the East Indians.

- (9) In addition, the average heights and weights of the Negro children in each age group and in both sexes were greater than those of East Indian children of the corresponding age group and sex.
- (10) The average weights of both the Negroes and East Indian boys in each age group were below those of American boys of the same ages.
- (11) The average heights of both Negro and East Indian boys, with the exception of the Negro boys between the ages of 9 and 10 years, were below those of American boys of the same age period.
- (12) Within the limitations of the observations, the Negro boy between the ages of 9 and 10 years appears to be slightly superior to the American boy of the same age period.

268. *Milk Investigation.*—Four cows were selected from a controlled herd to supply the milk required in the milk distribution scheme.

269. Samples of the milk from each cow and one sample of the pooled milk from all four cows were taken approximately at weekly intervals for a period of about 3—4 weeks and submitted to bacteriological examination. At the last sampling one of the cows fell ill. In consequence, this animal was eliminated from the group and another substituted for it. This substitute was examined in a similar manner. The samples of milk taken from individual cows were taken directly into sterilized containers, while the samples of mixed milk were taken from a large container supplied by the producer. Judging from the total bacterial count, the samples of milk from each individual cow, with the exception of the last one (the substitute) on the whole were satisfactory. The total bacterial count in the samples obtained from the last cow was consistently high. The organism was not identified. The total bacterial count in the pooled samples varied somewhat, but on the whole was high.

270. The sediment from individual samples of milk from each of the four original cows taken at approximately weekly intervals was injected into guinea pigs to determine the possibility of tuberculosis in the cows. Three weekly tests of this kind were made. No evidence of tuberculosis has been found in any of the pigs killed four weeks after injection. A number of test animals still remain to be killed eight weeks after injection. No such test has yet been made of the milk from the substitute cow.

271. Three of the original cows—sick one excluded—and the substitute were tuberculin tested and found to be negative.

272. One sample of pooled milk from the four original cows was submitted to chemical analysis and found to be deficient in fat content.

273. *Dietary Investigation.*—The value of all the diets of the Public Hospital, Georgetown, with the exception of the diets of the Lady Thomson and Seamen's Wards, and the diets of the Onderneeming Industrial School have been calculated.

274. The diets of the Public Hospital, Georgetown, are numbered from I to VII. Diets I and II are intended for patients acutely ill, III and IV for convalescents, and V for East Indians who do not make use of certain foods contained in other diets, VI for patients paying 50 cents per day and policemen, and VII for overseas seamen.

275. Diets I, II, IV and V are low in caloric value, particularly so in the case of V.

276. Diets III and VI are about adequate, while diet VII is more than adequate to meet nutritional requirements.

277. Diets III, IV, V, VI and VII are inadequate in protective foods. Green vegetables and fresh fruits are conspicuously absent in every one of these diets.

278. The diets of the Onderneeming School are probably adequate in caloric value for the individuals concerned. While the percentage of calories supplied by proteins is sufficient, the percentage of calories supplied by carbohydrate is high, and the percentages supplied by fats and first-class proteins are low, particularly in the case of fats. The diets are inadequate in protective foods. Milk, butter, eggs and green vegetables are entirely absent from the diet, while fresh fruits are issued twice weekly, "when available from the school farm."

279. The foregoing are facts that have been determined by the Standing Committee on Nutrition. An extraordinary absence of precise observations on prevalence of deficiency diseases precludes any authoritative statement as to state of nutrition in this Colony. For that reason the Nutrition Committee are engaged in attempting to trace the sources and determine the weight of evidence which may permit the impressions and enthusiasms of contemporary professional and lay observers to serve a more useful purpose. In brief, while it is true that dietary deficiencies of several kinds have been observed, and that not necessarily associated with poverty, the volume of evidence is so scattered and is associated with such restricted groups, that it is not possible to justify any conclusion as to whether conditions with respect to nutrition are any better or worse than heretofore. The following are impressions of medical opinion in the Colony:—

(a) While florid cases of rickets, beri-beri, scurvy, and pellagra are not commonly seen, nutritional defects as indicated by a glazed tongue, leucoplakia at the angle of the mouth, dental caries, pyorrhea, papular eruptions on the lateral surface in the region of elbows and ankles, foot burning and paraesthesia are common. These are probably indicative of deficiencies of the vitamin B complex, as well as C. and possibly D.

(b) Xerophthalmia and night blindness are now commonly found, not only in miners from the auriferous and diamondiferous areas of the Colony, but also among coastal people who have never been into the interior of the Colony. These are indicative of a deficiency of Vitamin A.

(c) Chronic bronchitis with emphysema, megalocytic anæmia, diarrhoea, foot burning, paraesthesia are very common among the labouring class of East Indians, almost exclusively, and are probably associated with a deficient diet.

IX.—HOSPITALS AND DISPENSARIES.

A.—The Public Hospitals.

280. The public hospitals in the Colony (7) provide 954 beds. The nominal bed strength of estate hospitals was 1,495. "Colonna House" (a private nursing home in Georgetown) provides for about 50 cases and Mackenzie Hospital (Demerara Bauxite Company, Limited) has accommodation for about 67 cases.

281. The daily average number of patients in the Government hospitals (excluding Potaro and Kamakusa) was:—

	1936.	1937.	1938.
Public Hospital, Georgetown	... 587	588	613
Public Hospital, New Amsterdam	... 136	146	137
Public Hospital, Suddië	... 64	56	74
Public Hospital, Bartica	... 22	24	35
Public Hospital, Mabaruma	... 18	22	22

282. *Public Hospital, Georgetown.*—The erection of the new maternity wing was commenced and repairs were done throughout the hospital and its compound.

283. *Public Hospital, Berbice.*—Alterations and improvements have been mainly structural. The Steward's office, the storerooms, and the dispensary have been enlarged. A new out-patient department has been provided which includes consulting rooms, dressing room, irrigation room for venereal diseases cases, and a

dispensary designed to serve the requirements of this section only. A new gate lodge has been erected from which tickets to applicants for treatment are issued, and the use of the entrance controlled. The new mortuary has been supplied with four mortuary tables designed and manufactured at Plantation Blairmont.

284. *Public Hospital, Suddie*.—The new out-patient department has been completed and is now in use. The sanitary arrangements within the hospital have been improved.

285. *Public Hospital, Bartica*.—The new and detached nurses' quarters were completed in February and occupied in March. An extension of 60 feet was added to the old quarters for nurses in the hospital buildings and converted into the male ward, including accommodation for two paying patients. The old male ward is now used for female patients and the old female ward has been converted into a delivery room. Minor alterations were effected to the dispensary.

286. *Public Hospital, Mabaruma*.—Minor repairs to the buildings were effected. No new buildings or additions were undertaken.

287. *Public Hospital, Kamakusa*.—The dispensary was removed from adjoining the police station and is now situated in the hospital in a room previously used for paying patients.

288. The total number of patients admitted to Government hospitals was 21,609, as compared with 19,494 in 1937, and 20,251 in 1936.

289. The table below shows the number of new admissions to hospital during the year and furnishes approximate figures of admissions of the same patients on one or more occasions. The total thus furnishes in truer perspective the actual amount of sickness occurring in the Colony and treated at the public hospitals:—

TABLE LIII.

IN-PATIENTS.

Hospital.	Total admissions during year.	Persons admitted on one occasion (approx.)	Persons admitted on two occasions.	Persons admitted on more than two occasions (approx.)
Public Hospital, Georgetown ...	14,525	13,456	392	95
Public Hospital, Berbice ...	3,394	3,172	93	12
Public Hospital, Suddie ...	2,368	1,825	201	47
Public Hospital, Bartica ...	702	614	32	8
Public Hospital, Mabaruma ...	535	473	25	4
Public Hospital, Kamakusa ...	58	58	...	...
Public Hospital, Potaro ...	27	27	...	...
Total ...	21,609	19,625	743	166

290. The number of patients who sought treatment at the out-patient department of public hospitals is as follows:—

1934	...	61,640
1935	...	64,803
1936	...	54,439
1937	...	57,792
1938	...	61,392

291. Two classes of patients are treated at the out-patient department—"poverty" patients, who are required to pay 24 cents (1/-), and "pauper" patients, who receive free treatment.

292. The principal diseases treated in Government hospitals were :—

	Cases.	Deaths.
Malaria (including blackwater fever) ...	2,468	152
Dysentery ...	194	27
Enteric Fever ...	155	39
Bowel Diseases ...	490	114
Pneumonia (all forms)...	398	205
Tuberculosis (all forms) ...	483	163
Bronchitis ...	766	65
Nephritis ...	446	143
Diseases of the Heart (all forms) ...	505	166
Venereal Diseases ...	1,368	60
The Puerperal State ...	1,911	46

293. Elsewhere (Graph VI.) is a diagram showing the distribution of admissions and deaths from the combined public hospitals for the decennium 1928-37 of certain selected disease groups. Table LIV incorporates similar data for the years 1937 and 1938 showing the chief causes of admissions and deaths for the same group of hospitals. As determined from the lethal index for 1938 diseases of infancy retain their adverse position as a cause of death in hospital experience with both nephritis and diarrhoea and enteritis showing evidence of greater severity. All the other disease groups concerned show a more or less reduced lethal importance during 1938, either because of or despite the fact that a greater number of admissions was to be noted for the majority during 1937. The most significant alteration in the array concerns the group diseases of the heart.

TABLE LIV.

CHIEF CAUSES OF DEATH.

COMBINED HOSPITALS—SUMMARY. IN-PATIENTS.

Disease Groups.	1933.						1937.					
	Admissions.		Deaths.		Case Fatality. Rate %	Lethal Index.	Admissions.		Deaths.		Case Fatality. Rate %	Lethal Index.
	No.	%	No.	%			No.	%	No.	%		
Diseases of Infancy ... (160-163)	207	0.9	137	6.8	66.2	7.5	154	0.8	113	6.3	73.3	7.9
Diseases of the Heart ... (88-90)	505	2.5	166	8.3	32.9	3.3	395	0.9	122	6.8	30.9	7.6
Tuberculosis: all forms ... (31-37)	483	2.2	163	8.1	33.7	3.7	530	2.6	197	10.9	37.2	4.2
Bronchitis and pneumonias ... (99-101)	1,164	5.2	270	14.0	23.3	2.7	903	4.4	227	12.6	25.1	2.9
Nephritis: all forms ... (5)	416	1.9	143	7.1	34.3	3.7	556	2.7	111	6.2	20.0	2.3
Diarrhoea and Enteritis ... (113)	471	2.1	111	5.5	23.6	2.5	401	2.0	60	3.3	15.0	1.6
Abnormalities of Puerperal State*	627	2.8	46	2.3	7.3	0.8	580	2.9	62	3.4	10.7	1.2
Malaria: all forms ...	2,468	11.0	152	7.6	6.2	0.7	2,177	10.7	127	7.1	5.8	0.7
Total ...	6,277	28.0	1,188	59.3	...	2.1	5,696	27.6	1,019	56.7	...	2.1
Other causes ...	16,143	72.0	816	40.7	...	0.6	14,602	72.4	779	43.3	...	0.6
Grand total ...	22,420	100	2,004	100	Mortality Rate 892 per 10,000 admissions		20,298	100	1,798	100	Mortality Rate 888 per 10,000 admissions	

* The Puerperal State loss normal labour.

() Number enclosed refers to rubric of contemporary classification of diseases.

294. The heterodox group, abnormalities of the Puerperal State has been introduced to give clearer emphasis to this factor which tends to be concealed by the large number of normal labours that enter into the classification.

295. The private hospital in Georgetown under the management of Dr. Craigen, Dr. C. Romiti and Dr. A. Romiti continued to provide valuable medical and surgical assistance, especially to those of the community requiring such treatment, who are

normally taken care of in nursing homes. The daily average number of beds occupied was 44. The total number of admissions was 1,252 and the number of surgical operations performed was 1,036.

296. The training of nurses was continued at the Government hospitals in Georgetown, New Amsterdam, and Suddie. The annual examination for the Government graduate nurses' certificate was held in June, 1938. The following were the results of the examinations :—

Training School.	First Professional Examination.		Final Examination.	
	Entered.	Passed.	Entered.	Passed.
Georgetown Hospital ...	17	16	15	15
New Amsterdam Hospital ...	...	...	2	2
Suddie Hospital ...	2	2	2	1

297. In addition, 39 pupil midwives were presented for the midwifery examination and 28 passed.

298. Table LVIII shows the accommodation, number of patients and deaths, average stay, percentage of mortality on number treated, and number of out-patients in each hospital.

299. Table LIX gives the classes of in-patients and out-patients treated and the number of prescriptions dispensed.

300. Table LX gives in detail the diseases of out-patients and in-patients treated.

301. Table LXI is a return of the surgical operations performed.

302. The number of in-patients treated was 22,420, as compared with 20,298 in 1937.

303. The cost per caput per diem of patients treated, exclusive of medical officers' salaries, was :—

	1936.	1937.	1938.
	cents.	cents.	cents.
Public Hospital, Georgetown ...	61.7	61.6	65.5
Public Hospital, New Amsterdam...	72.2	61.7	72.1
Public Hospital, Suddie ...	85.6	94.7	75.4
Public Hospital, Bartica ...	75.6	70.1	77.9
Public Hospital, Mabaruma ...	94.2	74.1	123.3

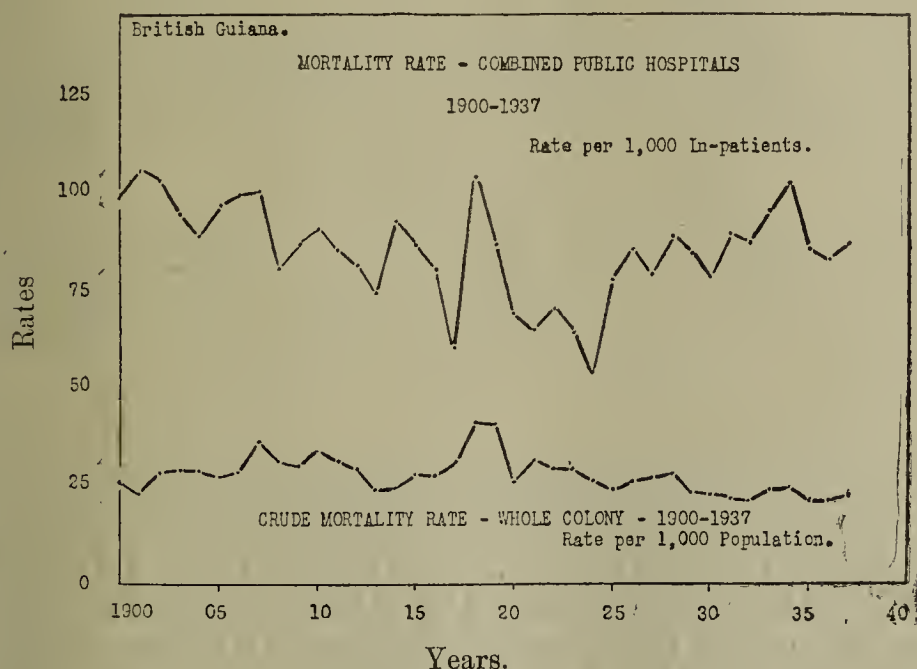
Morbidity and Mortality Summary—Combined Public Hospitals, 1900–1937.

304. In order to give permanent record to the data assembled for the information of the Royal Commission to the West Indies, opportunity is now taken to incorporate a summary of the rates and graphic material derived from a study of the Reports of the Surgeon-General since 1900. While it had been assumed that the diagnostic data available for this study would have greater accuracy than that to be found in the Reports of the Registrar-General, it is evident that this assumption has been vitiated by certain unexplained anomalies in record and practice which become apparent from study of the specific factors under review. An attempt was made to select the data of the past so that it would provide fair comparison with the contemporary system to be found in the return of diseases (in-patients) from the public hospitals. The fundamental inaccuracies of this study are acknowledged. The only merit claimed is that it represents the first extended attempt to review some of the general benefits and possible deficiencies of public hospitals in British Guiana. The specific disease groups were selected for the reason that similar but not necessarily identical groups were the subject of review from the Reports of the Registrar-General over the same period.

305. The amount of illness in the Colony is not known although some idea of this may be deduced from the crude mortality rates. Hospital morbidity rates fail to assist in clarifying this situation but are of interest in showing the reasons for which the public make use of hospitals as in-patients.

306. The mortality experience of hospitals since it represents a universe comprising the sick and injured must necessarily be greater than that of the Colony which is based upon the whole population, sick and well. Graph V shows the comparison between these two factors from which it is evident that because of the advanced state of illness upon admission and the type of illness or injury for which

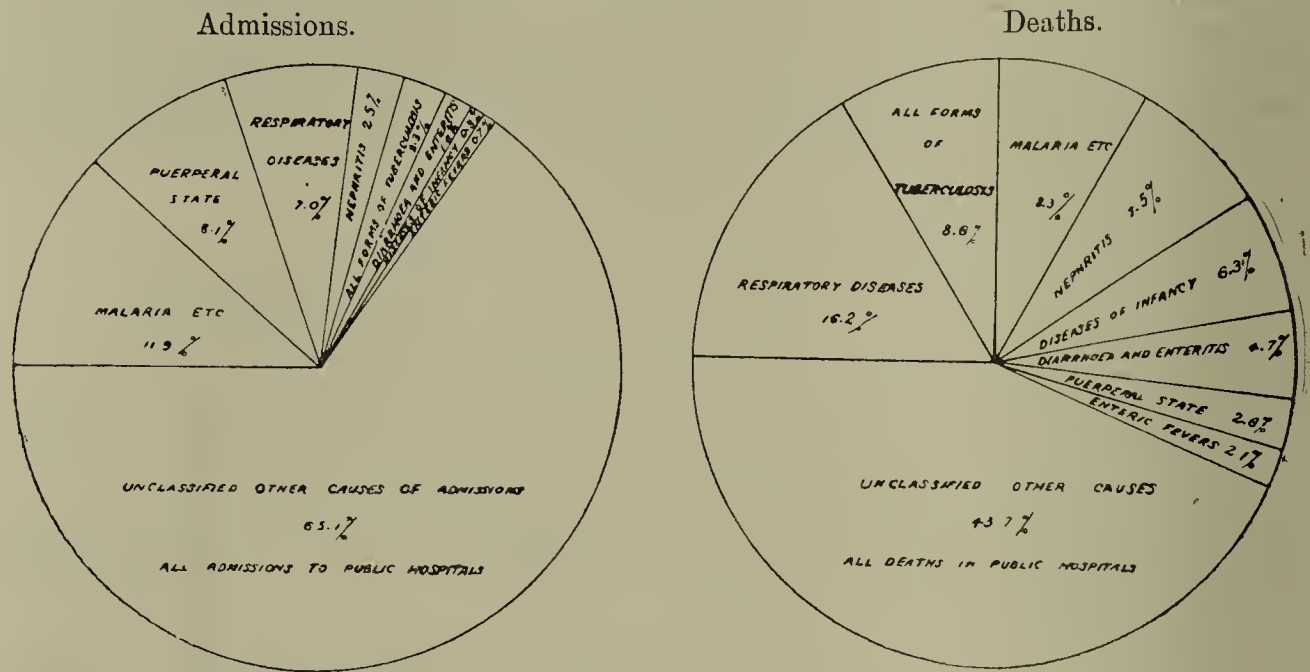
GRAPH V.



admission is sought, the mortality rates for the combined hospitals have been between twice and four times that of the Colony as a whole. Over the period under review the Colony rate has been relatively constant with a falling trend since 1921, whereas the hospital rate has been subject to wide fluctuations and varying trends. Since 1924 there has been a distinctly upward trend in the hospitals mortality rates, which from reference to the fatality rates available appear to have some explanation from the Diseases of Infancy, all forms of Malaria, and Diseases of the Puerperal State. In these groups at least the indication is that the advantages of hospital treatment may have been considered as a last resort. The reasons for such postponement amongst a people who are in the position to choose cannot fairly be blamed upon institutional treatment as such.

307. The relative significance of the selected diseases and disease groups in the vital statistics of the combined public hospitals was determined for the decennium 1928-37 and is shown in graph VI. as percentages of the total admissions and total

GRAPH VI.



Distribution of Selected Groups of Diseases as Admissions and Deaths
Combined Public Hospitals 1928-1937.

deaths in the hospitals over that period. It is evident that the 8 groups here shown represent 34.9% of the admissions and 56.3% of the total deaths. The importance of these entities as causes of death has been adduced as a convenient factor which has been designated a “specific lethal index” because our available references fail to indicate the use and correct designation of such a factor. This index is derived from the equation $\frac{RtD^1}{RtM^1}$ where RtD^1 = the death ratio of disease (1) in the particular universe, RtM^1 =the morbidity (admission) ratio of the same disease (1) in the same universe.

308. Table LV shows the assembly of this factor as it concerns the disease groups under consideration. Apologies are hereby tendered for any breaches of the cardinal biometrical conventions, but extenuating circumstances are claimed to arise from the apparent absence of correlation in the unorthodox “pie-diagrams.” This index at least conveys some idea of the advanced state of the diseases represented when the patients concerned failed to respond to hospital treatment and as such may serve to indicate the prognostic experience.

TABLE LV.

LETHAL INDEX.

SUMMARY OF ADMISSIONS AND DEATHS FROM SPECIFIC CAUSES—COMBINED PUBLIC HOSPITALS—1928-37.

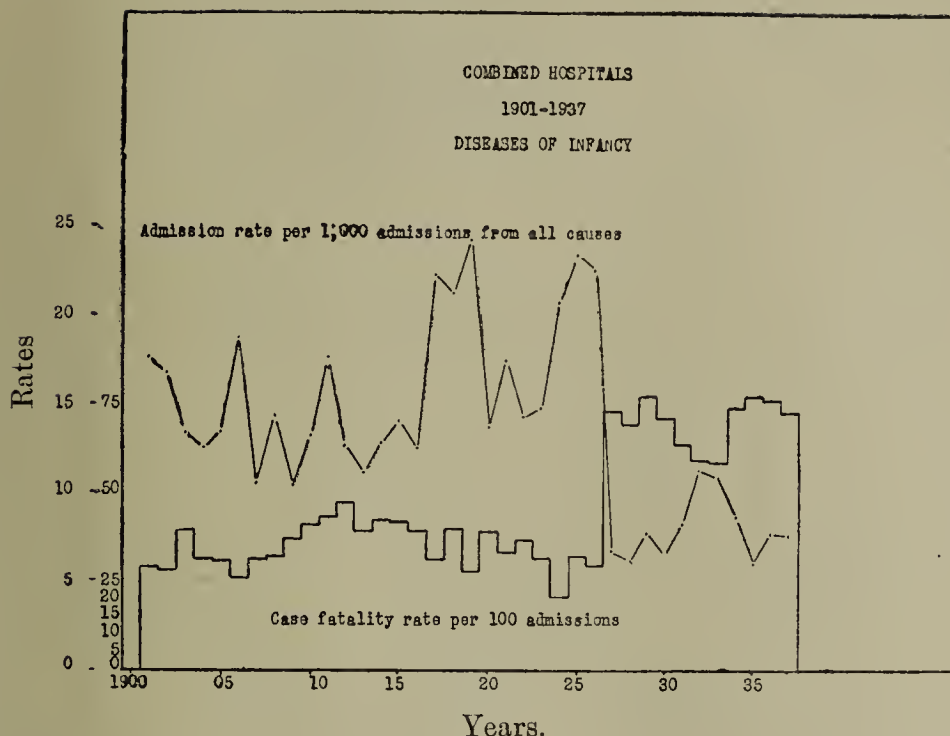
Disease Group.	RtD. %	RtM. %	Lethal Index.
			$\frac{RtD}{RtM}$
Diseases of Infancy (1) ...	6.3	0.8	7.87
All forms Tuberculosis (2) ...	8.6	2.3	3.73
All forms Nephritis (3) ...	7.5	2.5	3.00
Enteric Fevers (4) ...	2.1	0.7	3.00
Diarrhoea and Enteritis (5) ...	4.7	1.6	2.94
Respiratory Diseases (6) ...	16.2	7.0	2.31
All forms of Malaria (7) ...	8.3	11.9	0.69
Diseases of Puerperal State (8) ...	2.6	8.1	0.32

RtD.—Proportion of all deaths.

RtM.—Proportion of all admissions.

DISEASES OF INFANCY.

GRAPH VII.

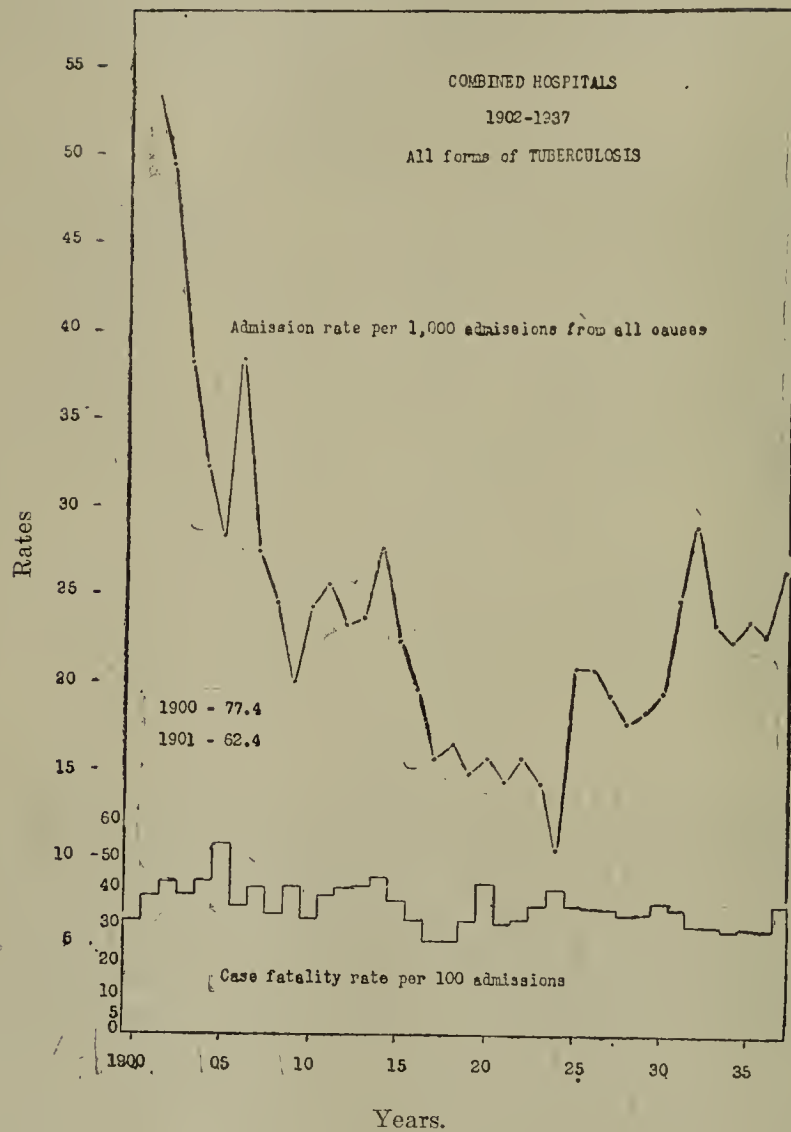


The erratic character of this admission rate curve is not possible of explanation. The conditions which make up this group lack aetiological specificity to such an extent that one cannot fail to record a suspicion that greater precision in diagnosis might have reduced the curve to a proportion that would have some evident correlation with other events affecting the vital statistics of the Colony. The peculiar change in both admission rates and case fatality rates commencing in 1927 have no recorded explanation. Enquiries elicit the information that about that time the Infant Welfare and Maternity League commenced or extended the treatment of sick infants in their clinics. While proof is not forthcoming, the altered relationships suggest that the hospitals then admitted infants after clinic treatment had failed to be beneficial, and as such the risks of these infants dying while under hospital care increased. Some support to this conjecture is given from the reduced case fatality rates to be observed between 1930 and 1934 when the admission rate from this cause increased. Since the treatment of the conditions included in this group is most often one of infant feeding and not medicinal, the question must be raised as to whether infant welfare clinics should not restrict their activities to the preventive problems. The answer given to this query is that mothers will not attend unless the attendants are prepared to give medicines. The tragedy of the situation is that not infrequently the attendants appear to place greater confidence in medicines than is justified. The fault must necessarily have origin in faulty training or supervision of both attendants and mothers. The lethal importance of this group of diseases in hospital practice raises the additional question of whether there is not justification for a paediatrician on the medical staff for consultation and training purposes in addition to directing the infant welfare programme.

310.

ALL FORMS OF TUBERCULOSIS.

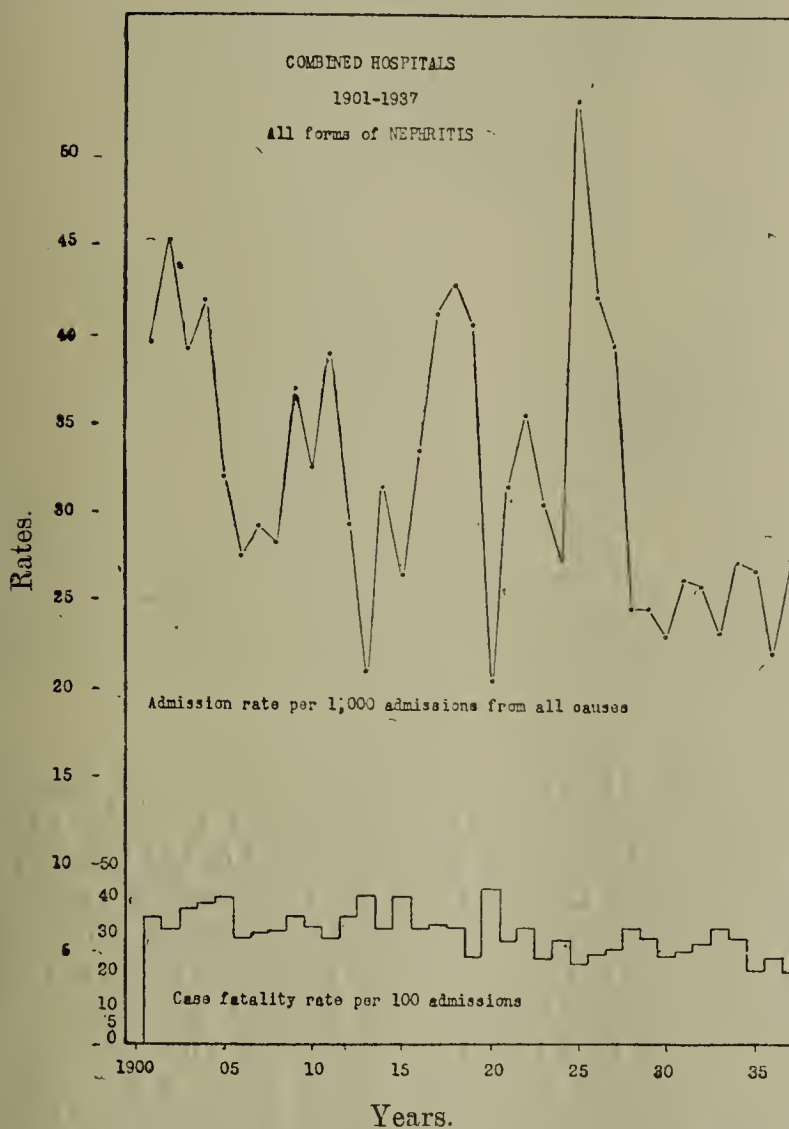
GRAPH VIII.



Elsewhere in this report it is to be noted that hospital treatment of tuberculosis is usually a terminal event. It is believed that the admissions curve in the earlier decades probably indicates that the diagnosis of tuberculosis was largely restricted to hospital practice. Since the mortality rate for the Colony from this cause shows evidence of a steady decline, the increased admission rate since 1924 probably signifies a greater availability of bed accommodation and an increased realisation of the benefits of hospital treatment. The relative steadiness of the case fatality rates over that period in contrast with the erratic character of the rates prior to that time suggests that the diagnosis may be more valid or that terminal "hospitalization" of tuberculous cases is less frequent than in the past. The latter suggestion is afforded little support by the specific lethal index.

ALL FORMS OF NEPHRITIS.

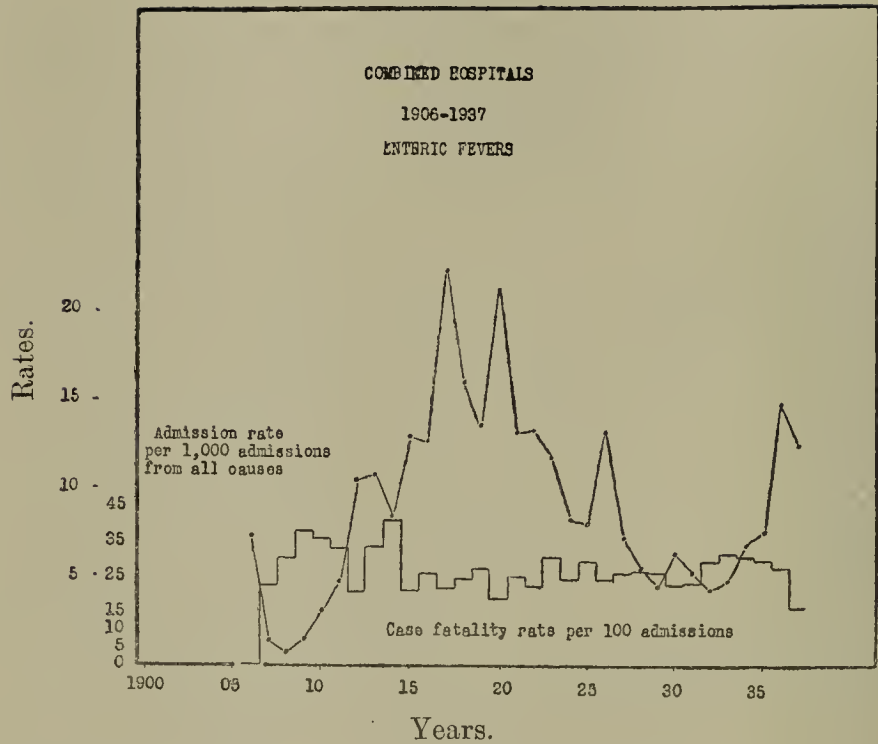
GRAPH IX.



The diagnosis of the various forms of nephritis should be possible of close confirmation in hospital practice. The situation indicated by the curve of admission rates conveys the impression that a differentiation between cause and effect could not have strictly governed diagnosis in the past. The best that may be said is that since 1928 there appears to have been some notable change in the clinical viewpoint or that there has been a real decrease in the number of cases. By reference to the case fatality rates and lethal index it appears that a somewhat nearer approach to the truth may now have been attained.

ENTERIC GROUP OF FEVERS.

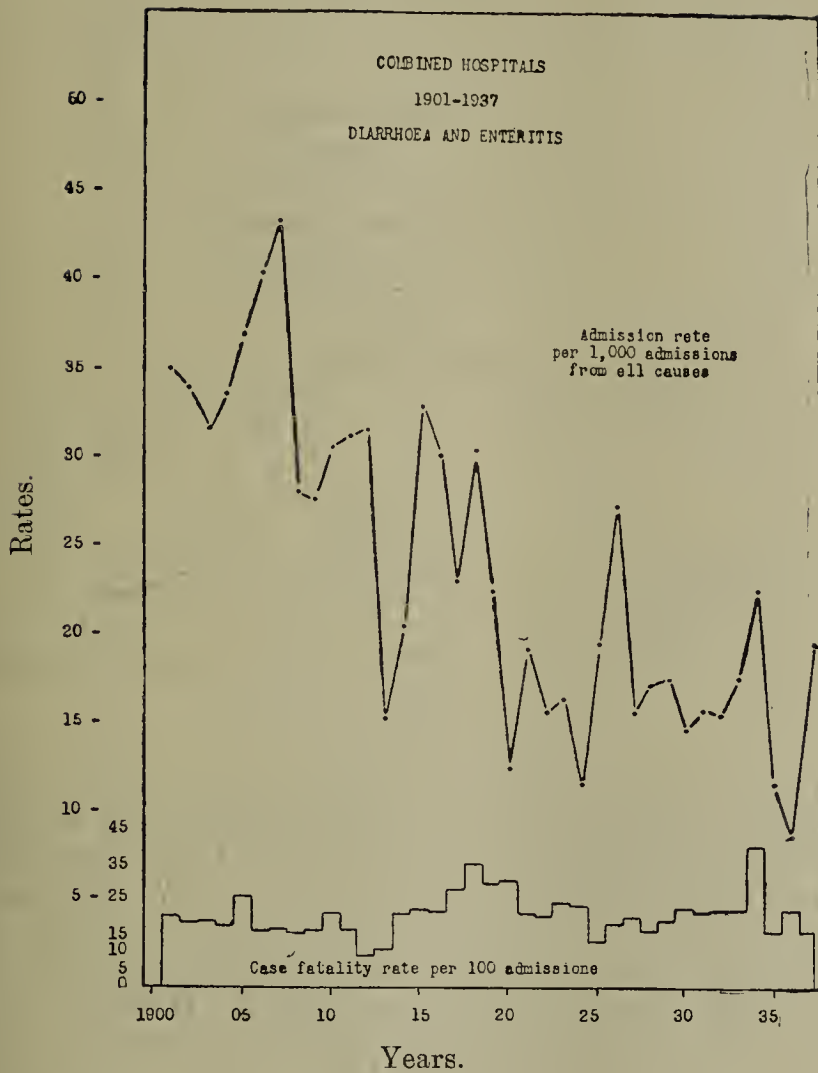
GRAPH X.



It is difficult to decide what the admission rates curve may indicate. From 1900-1905 the admissions were so few that it was not possible to make a graphic record. In 1906 a bacteriologist was first appointed to the Colony, and an admission rate from these causes of 7.2 per 1,000 total admissions appeared. In view of the general resemblance of this curve to that of the specific mortality rate from the enteric fevers for the Colony, there is some reason to suggest that the admissions curve may represent the effectiveness and clinical popularity of bacteriological methods of diagnosis rather than the true experience with the diseases concerned. From a survey of reported cases noted elsewhere, it seems possible that the cases of endemic typhoid or the paratyphoid forms may be so atypical as not to seek hospital treatment or that diagnosticians occur in "epidemic" form rather than the diseases. The significant reappearance of these diseases since 1935 is noteworthy.

DIARRHOEA AND ENTERITIS.

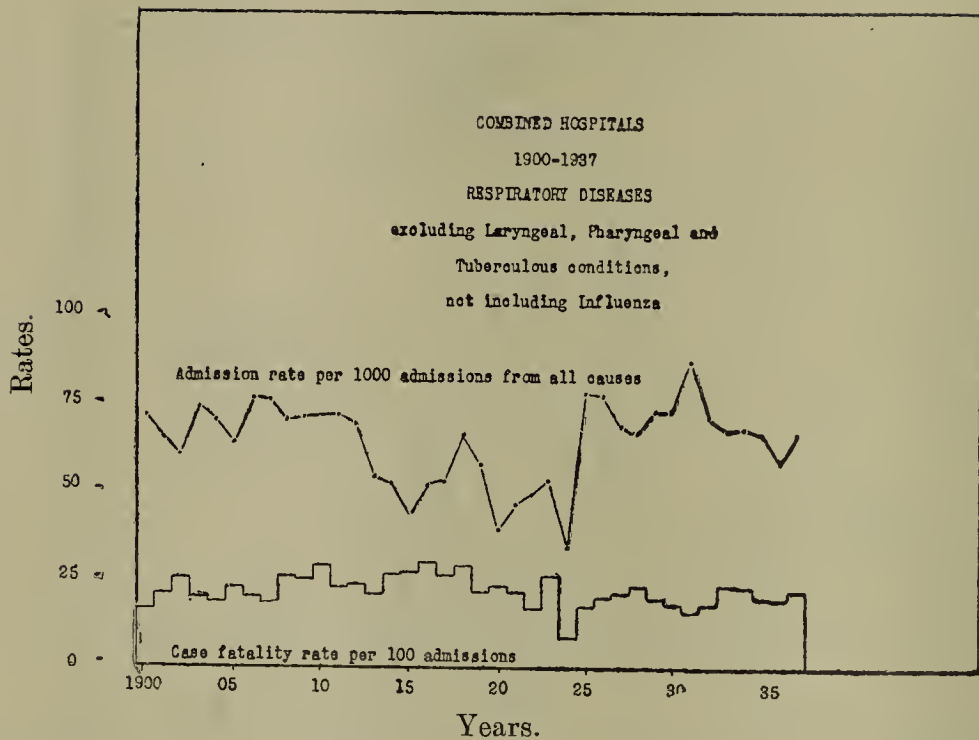
GRAPH XI.



Diarrhoea and Enteritis as a diagnosis in hospital practice must necessarily be viewed with some apprehension. In view of the evident relationship between the arrival of a bacteriologist and the recognition of the enterics, the abrupt decline in diarrhoea and enteritis after that event is noteworthy. A similar coincidental influence on this diagnosis may also be postulated at other intervals when the enterics appear to have had uncommon recognition. From such epidemiological information as is now available it would appear justifiable to consider that diarrhoea and enteritis may represent a considerable proportion of the undiagnosed enterics as well as other undiagnosed diseases in which the specified signs of disease for various reasons may have concealed the specific diagnosis. The trend of admissions to the combined public hospitals from diarrhoea and enteritis appears to be on the decline. Perhaps the realisation that this "omnibus" diagnosis indicates incomplete investigation may be sufficient to stimulate some overdue clinical and post mortem research. The case fatality rates offer little indication that the hospital treatment of this type of case has shown any notable improvement.

RESPIRATORY DISEASES.

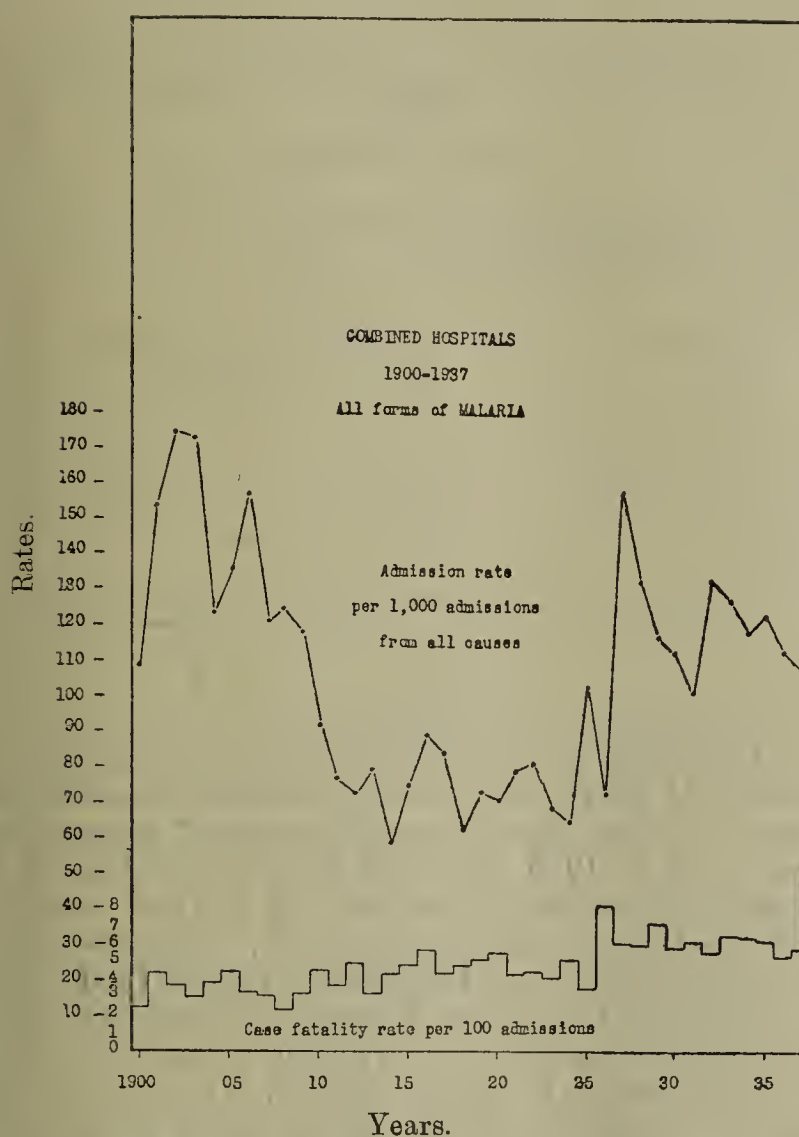
GRAPH XII.



Until comparatively recently the specific treatment of the pneumonias which constitute the major component of the assembled respiratory diseases has not been available. The benefits of hospital treatment have thus been directed chiefly to ensuring the full effects of "*vis medicatrix naturae*." With a lapse between 1912 and 1924, the admission rate has remained relatively constant. Since the latter year, the fatality rates gives some evidence that the risks of dying in hospital from these causes have tended to be less than previously. Although the situation here indicated shows no spectacular alteration, it offers less scope for criticism than any of the other groups under consideration. Being without substantial evidence of the type-distribution of pneumococci in this Colony, comment on the relatively high case fatality rates prevailing cannot be effective. This lack of information and the fact that in a Colony where several racial groups are established there is no precise knowledge to be found dealing with the racial distribution and mortality rates from these diseases alone, indicate a distinct lag in the investigative spirit or facilities which at one time were to be found in the medical service of the Colony.

ALL FORMS OF MALARIA.

GRAPH XIII.

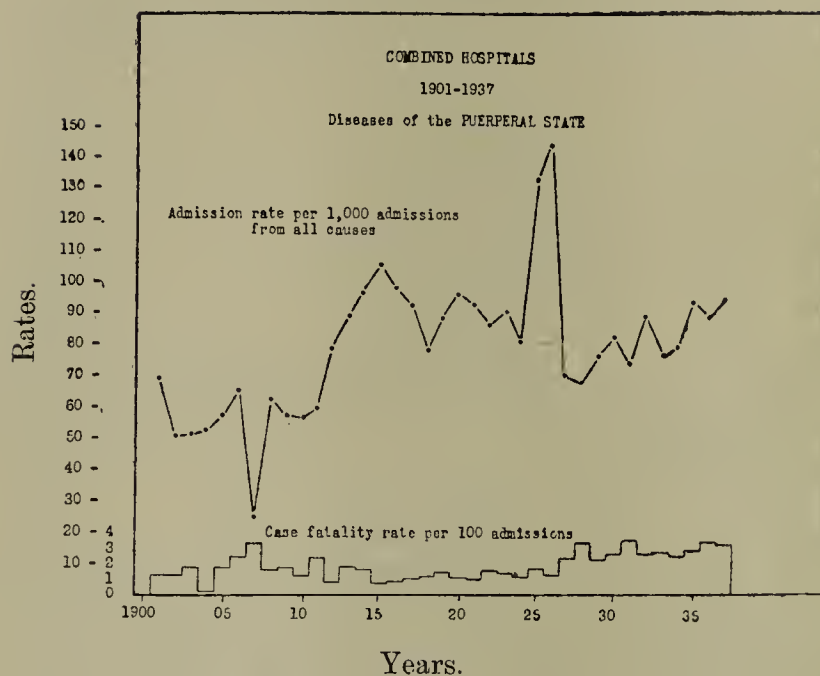


Malaria as a cause of death in British Guiana has outstanding significance. The experience indicated from the hospitals admission rate curve offers means for considerable speculation. In December, 1906, the sale of prophylatic quinine at cost price through the post offices commenced, and still continues. Logarithmic study of the sales curve shows that the self-administration of this drug increased intermittently until 1927. The specific mortality declined until 1914, but since that time, has remained relatively constant with evidence of cyclic epidemics. It is postulated that the sale of this drug may be a factor in explanation of the "saddleback" character of the curve under consideration, wherein hospitals ceased to be called upon to treat malaria. The drug has been distributed in the form of totaquina since 1931. It is common knowledge that the effectiveness of "Government quinine" is at present questioned by a proportion of the community. Records indicate that the original distribution was designed for prophylatic purposes in packets of seven 5 gr. tablets. It will be understood that the failure of such a total dosage of this drug for therapeutic purposes must bring the system and the drug into disrepute. It is suggested that the hospital rates may therefore be reflective of this situation. The restoration of confidence in the effectiveness of the drug that has fallen into disrepute must necessarily be a more difficult task than if this failure in the system had not arisen.

316. If opinion as to the close relationship between chronic malaria and nephritis is substantial, it cannot fail to be considered that some correlation may exist between inadequate self-treatment of malaria in its acute form as suggested above, and subsequent deaths and chronic illness from nephritis. The Colony mortality rates and the hospital experience offer some possible indication in support of this which will bear clinical investigation.

DISEASES OF THE PUERPERAL STATE.

GRAPH XIV.



The anomalies of hospitals statistics are unfortunately conspicuous under this head in the years 1925 and 1926 arising from presumed misunderstandings in compilation. In the former "Other Accidents of Pregnancy" account for the abnormal increase in that year, and in 1926 the trend is perpetuated as "Infants." While these errors are corrected in the subsequent records, it is not certain that the preceding records are entirely free of such discrepancies. Midwives have been trained in this Colony and licensed under the Medical Board since 1900. Elsewhere in the report it has been observed that there is reason to question the effectiveness and perhaps efficiency of practising midwives as a group. The maternal mortality rate for the Colony is absurdly high. In the last decade, it is apparent that many of the abnormal cases reaching hospitals are in an advanced pathological state. The evidence is that many of these conditions arise from the lack or inadequacy of prenatal observation. Facilities are widely dispersed whereby services of subsidised midwives and prenatal attention may be utilised. To fairly allocate the culpability is difficult in a community where pregnancy is a commonplace occurrence and the professional treatment of illness is postponed until after other forms of treatment have been exhausted. It is acknowledged that the standards of midwifery leave much to be desired, but the conspicuous fact remains that full use is not being made of the facilities that are available. Hospital experience since 1928 indicates that there is a greater reference of cases to the public hospitals, and it would appear evident from the case fatality rates that the prognosis of such cases does not improve. Since the incidence of puerperal sepsis in hospital practice or elsewhere is not of a significant proportion, the reason for this must be associated with unnecessarily delayed reference to the hospitals of patients suffering from other pathological conditions. It may be observed here that the lethal index of this group has basic reference to normal as well as abnormal pregnancy, and for that reason the significance of the pathology of pregnancy is not evident.

STATISTICAL SUMMARY.

COMBINED PUBLIC HOSPITALS, BRITISH GUIANA.—1900-1937.

SPECIFIC ADMISSION RATE PER 1,000 ADMISSIONS FROM ALL CAUSES. CASE FATALITY RATE PER 100 ADMISSIONS FROM SPECIFIC DISEASE GROUP.

Year.	Diseases of Infancy.		All Forms Tuberculosis		All Forms Nephritis.		Enteric Fevers.		Diarrhoea & Enteritis.		Respiratory Diseases.		All forms of Malaria.		The Puerperal State.	
	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.	Admissions.	Fatality.
1900	99	...	77	32.4	...	35.5	2.3	30.8	...	72	16.9	108	2.4	...	...	...
1901	105	28.1	62	39.1	40	35.5	0.64	25.0	35	65	20.6	158	4.4	69	...	1.3
1902	103	27.4	49	42.8	45	31.9	0.54	25.0	34	60	25.0	175	3.7	50	...	1.3
1903	94	39.5	38	37.8	39	37.8	...	...	32	75	19.6	173	3.0	51	...	1.7
1904	88	31.1	32	43.5	42	39.1	0.11	100.0	33	70	18.8	124	3.9	53	...	0.3
1905	96	30.7	28	54.0	32	40.9	...	...	37	64	22.5	135	4.5	57	...	1.7
1906	99	26.0	38	36.7	27	29.6	7.2	0.82	40	76	19.9	157	3.3	65	...	2.4
1907	100	31.4	27	41.2	29	31.2	1.4	22.2	43	75	17.4	121	3.1	25	...	3.3
1908	80	32.0	25	34.8	28	31.5	0.9	30.0	28	70	25.6	125	2.3	63	...	1.5
1909	86	37.4	20	40.5	37	35.5	1.7	38.8	28	70	24.8	118	3.2	57	...	1.6
1910	90	40.3	24	32.7	33	33.6	3.1	35.7	31	72	28.3	92	4.6	57	...	1.3
1911	85	43.6	26	39.1	39	29.6	4.8	32.5	31	72	22.9	77	3.8	60	...	2.3
1912	81	47.7	23	40.6	29	35.2	10.5	20.6	32	68	23.3	74	5.0	79	...	0.9
1913	74	39.5	21	41.2	21	41.6	10.8	33.0	15	54	20.2	80	3.2	89	...	1.9
1914	92	42.7	28	44.7	32	32.7	8.5	41.1	20	52	26.5	60	4.4	96	...	1.7
1915	86	42.2	22	37.6	26	41.6	13.0	20.8	33	44	26.9	75	4.9	105	...	0.9
1916	80	39.0	34	32.7	34	32.7	12.8	26.0	30	51	29.4	90	5.8	99	...	1.0
1917	60	31.0	41	25.6	41	34.0	22.3	22.1	23	53	25.8	85	4.4	92	...	1.1
1918	104	39.9	16	25.6	43	33.6	16.0	24.5	31	53	28.7	64	4.8	78	...	1.2
1919	86	27.6	15	32.0	41	24.3	13.6	27.2	22	57	21.0	74	5.2	88	...	1.6
1920	69	38.9	15	42.6	20	43.0	21.2	19.0	12	39	22.6	71	5.6	95	...	1.2
1921	65	33.2	14	31.0	31	28.8	13.3	25.0	19	46	20.9	79	4.4	92	...	1.0
1922	70	36.8	16	32.9	36	32.5	13.4	22.4	16	48	16.2	80	4.5	87	...	1.6
1923	64	31.2	14	36.4	31	24.1	11.9	30.4	16	53	25.1	68	4.2	90	...	1.3
1924	53	20.5	10	41.3	27	29.1	8.2	24.5	12	28	8.3	65	5.2	80	...	1.2
1925	77	32.2	21	36.7	53	21.8	8.0	28.6	20	77	17.2	104	3.5	133	...	1.8
1926	85	29.7	21	35.9	42	24.9	13.2	24.7	27	77	19.8	73	8.2	144	...	1.4
1927	79	73.2	19	35.7	40	26.0	7.1	26.9	16	68	20.4	158	6.1	70	...	2.4
1928	88	69.2	18	34.2	23	32.5	5.6	27.2	17	66	23.5	132	6.0	67	...	3.3
1929	84	77.5	18	34.4	25	29.5	4.6	26.4	17	78	19.2	117	7.3	76	...	2.2
1930	77	71.0	19	37.3	23	24.7	6.3	23.4	15	78	17.4	113	5.9	83	...	2.7
1931	89	64.6	25	35.2	26	25.8	5.1	23.5	16	87	15.6	101	6.2	75	...	3.5
1932	87	59.8	29	30.9	26	27.8	4.3	29.2	16	70	17.3	133	5.7	89	...	2.6
1933	95	58.8	23	30.7	23	32.6	4.8	31.2	18	67	23.6	127	6.7	76	...	2.8
1934	102	74.2	23	29.4	27	29.6	6.8	30.1	23	67	22.7	119	6.6	79	...	2.7
1935	35	77.3	24	30.0	27	20.1	7.5	29.6	12	66	19.4	124	6.3	95	...	2.8
1936	82	76.2	23	29.8	22	24.4	14.9	27.1	9	57	19.0	113	5.3	89	...	3.3
1937	86	73.2	26	37.1	27	20.0	12.5	16.6	20	66	21.6	107	5.8	94	...	3.2
1928-37 Percentage of Totals.		Admissions. 0.8	Admissions. 2.3	Deaths. 8.6	Admissions. 2.5	Deaths. 7.5	Admissions. 0.7	Deaths. 2.1	Admissions. 1.6	Deaths. 4.7	Admissions. 7.0	Deaths. 16.2	Admissions. 11.9	Deaths. 8.3	Admissions. 8.1	Deaths. 2.6

Summary.

The pedantic nature of this review is not designed to be critical of the past, but is put forward with the object of indicating to what end improvements may be directed. The ordinary routine of hospital practice under the conditions that prevail in British Guiana tends to leave little time for investigation. Enquiry directed to the unknown may make for fame, but investigation of the common diseases still offers much scope to those who are prepared to devote the time to it. If the public hospitals of this Colony are to serve their proper function, it becomes necessary that they should not be restricted to the treatment of disease alone. There is a comparatively virgin field for research in the ordinary practice of medicine here and the need for it is indicated from this review.

OPHTHALMIC DEPARTMENT.

319. The staff consists of:—

Government Ophthalmologist.

One nurse in charge (whole-time).

One assistant nurse and several part-time nurses.

One clerk.

320. 5,675 patients were treated during the year as against 5,452 for the previous year. The following table shows the distribution:—

TABLE LVII.

Public Hospital.	IN-DOOR PATIENTS.						OUT-DOOR PATIENTS.					
	Paying.			Pauper.			Paying.			Pauper.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
Georgetown ...	38	24	62	198	138	336	698	620	1,318	1,885	1,648	3,533
New Amsterdam ...	1	...	1	4	9	13	82	89	171	82	90	172
Suddie ...	1	...	1	...	2	2	18	5	23	28	15	43
Total ...	40	24	64	202	149	351	798	714	1,512	1,995	1,753	3,748

321. The following major and minor surgical operations were performed:—

	Public Hospital, Georgetown.	Public Hospital, New Amsterdam.	Public Hospital, Suddie.
Senile Cataract ...	180	...	...
After Cataract ...	7	...	...
Congenital Cataract ...	13	...	...
Traumatic Cataract ...	6	...	...
Panophthalmitis ...	5	...	...
Pterygium ...	28	2	1
Glaucoma ...	16	...	...
Entropion ...	7	...	...
Foreign body of Cornea ...	1	2	...
Leucoma of Cornea ...	2	...	...
Rupture of Cornea ...	3	...	...
Corneal Ulcer ...	2	1	...
Dacryocystitis ...	7	...	...
Prolapse of Iris ...	4	...	...
Phthisis Bulbi ...	4	1	...
Papilloma of Eyelid ...	4	...	...
Narrowed Socket ...	1	...	...
Abscess of Eyelid ...	3	...	...
Cauterization of Ulcer ...	...	3	...
Tarsal Cyst ...	2	4	...
Iritis ...	4	...	...
Symblepharon ...	1	...	...
Total ...	300	13	1

322. In addition, 130 minor operations were performed at the out-patient department of the Public Hospital, Georgetown.

323. The revenue derived from all sources was \$1,255.88 as compared with \$1,258.91 in 1937.

324. The number of cases refracted and received prescriptions for glasses was 314.

325. A number of cases were treated at the Leprosy Hospital and two cataract operations were performed.

326. 21 new cases of trachoma were notified. It is felt that this number represents a small proportion of the cases actually in existence throughout the Colony.

DENTAL DEPARTMENT.

Public Hospital, Georgetown.

327. The staff consists of :—

Dental Surgeon (part-time).

Clerk.

Assistant nurse.

328. The clinic was opened to the public daily in the afternoon except on Sundays and Public Holidays.

329. The number of out-patients treated was 7,416 as compared with 7,329 in 1937. 4,711 were pauper cases (1,747 males, 2,964 females) and 2,705 poverty cases (1,331 males and 1,374 females.)

330. The revenue collected amounted to \$379.80 compared with \$369.72 the previous year.

Public Hospital, New Amsterdam.

331. The clinic at this hospital is conducted by Dr. G. M. Gonsalves, dental surgeon, as part-time dental surgeon assisted by a junior nurse.

332. The clinic was held thrice weekly.

333. The number of patients treated was 1,505.

334. The revenue collected amounted to \$206.88.

X-RAY AND ELECTRICAL DEPARTMENT.

Public Hospital, Georgetown.

335. The staff of the department consists of—

Radiographer.

Assistant Radiographer.

Two nurses.

336. There has been an increase in the amount of work done in the department, particularly in the matter of accessory sinus and chest examinations, and X-ray treatments of skin lesions.

337. The X-Ray Therapy room and the Artificial Sunlight room were completed during the year and have been found to facilitate treatment.

338. Throughout the year the weekly clinic for the Tuberculosis Society was continued.

339. The total number of patients examined during the year was 3,754, being 320 more than the previous year. Of these 170 were examined at the request of private practitioners and Government Medical Officers in districts. 932 cases were examined for the Tuberculosis Society and 22 cases for the Infant Welfare Centre.

340. The total number of radiosopic examinations was 1,561.

341. The following table gives some indication of the type of examinations made :—

Barium Meals	...	...1,057 (223 cases).
Barium Enemas	...	... 68
Chests	...	...1,681
Accessory Sinuses	...	... 385
Urinary Tracts	...	... 83
Gall Bladders	...	... 165
Teeth	...	... 211
Miscellaneous	...	... 2,691

342. *X-Ray Treatment*.—There was an increase of 29 in the number of patients who attended for treatment in comparison with the previous year. 57 patients received 232 treatments in all. Of these 41 were sent by private practitioners and Government Medical Officers in districts. The conditions treated were as follows :—

Dermatitis	...	...	...	29
Carcinoma	...	...	...	5
Warts	...	...	...	5
Keloid Scars	...	...	...	3
Eczematous Eruption	...	...	...	2
Epithelioma	...	...	...	2
Rodent Ulcer	...	...	...	2
Ring Worm	...	...	...	1
Myelogenous Leukæmia	...	...	...	1
Malignant Tumour	...	...	...	1
Lymphatic Leukæmia	...	...	...	1
Filariasis	...	...	...	1
Epidermomycosis	...	...	...	1
Lipoma	...	...	...	1
Papilloma	...	...	...	1
Menopause	...	...	...	1

343. *Electrical Treatment*.—225 patients were treated during the year, being 59 more than the previous year. In all 4,824 treatments were given.

344. The revenue collected during the year was \$1,693.15 as against \$1,221.96 in 1937.

Public Hospital, New Amsterdam.

345. The nature of the radiographic examinations was as follows :—

Chests	..	...	...	42
Dental Films	...	...	...	4
Miscellaneous	...	...	...	241
				<hr/> 287 <hr/>

346. One case was treated by X-rays.

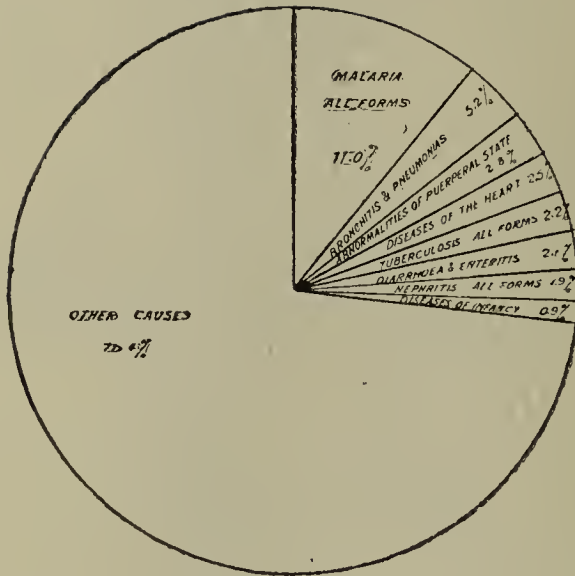
347. The revenue collected was \$66.07 as against \$58.95 for 1937.

TABLE LVIII.

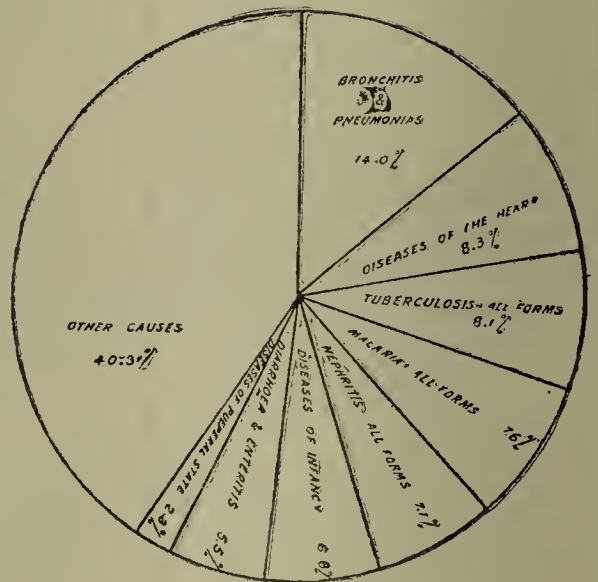
PUBLIC HOSPITALS.

	Georgetown.			New Amsterdam.			Suddie.			Bartica.			Mabaruma.			Kamakusa.			Potaro.		
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.
Accommodation ...	345	277	622	92	69	161	45	47	92	25	10	35	15	15	30	8	...	8	6	...	6
Patients remaining in Hospital—1st January, 1938 ...	312	242	554	84	60	144	36	33	69	15	6	21	14	9	23	...	...	...	...	...	...
Patients admitted during the year ...	8,182	6,343	14,525	1,970	1,424	3,394	1,307	1,061	2,368	499	203	702	265	270	535	58	...	58	27	...	27
Total ...	8,494	6,585	15,079	2,054	1,484	3,538	1,343	1,094	2,437	514	209	723	279	279	558	58	...	58	27	...	27
Patients discharged—cured ...	1,426	1,569	2,995	436	404	840	104	40	144	112	55	167	26	19	45	19	...	19	2	...	2
“ “ relieved ...	4,957	3,426	8,383	1,118	673	1,791	1,012	852	1,864	336	117	452	205	199	404	30	...	30	21	...	21
“ “ not relieved ...	853	733	1,586	150	128	278	72	30	102	6	3	9	13	8	21	5	...	5	4	...	4
“ “ not sick ...	134	79	213	44	75	119	11	23	34	1	1	2	2	22	24	...	...	...	...	...	...
“ “ died ...	790	541	1,331	224	139	363	107	112	219	34	19	53	19	17	36	2	...	2	...	...	...
Patients remaining in Hospital—31st December, 1938 ...	334	237	571	82	65	147	37	37	74	26	14	40	14	14	28	2	...	2	...	...	...
Total Patients treated ...	8,494	6,585	15,079	2,054	1,484	3,538	1,343	1,094	2,437	514	209	723	279	279	558	58	...	58	27	...	27
The daily average number in Hospital during 1938 ...	345	268	613	79.6	57.6	137.2	37.6	36.3	73.9	25.2	9.4	34.6	9.1	12.7	21.7	1.2	...	1.2	0.07	...	0.07
Average stay in days of patients discharged during 1938 ...	15	14	15	15.5	15.5	15.5	9.7	11.7	10.6	19.8	18.2	19.3	13.7	13.7	13.7	7.2	...	7.2	5.9	...	5.9
Average stay in days of patients remaining on 31st December, 1938 ...	56	57	56	21.6	32.4	26.3	10.8	16.0	13.4	21.1	39.0	27.4	15.0	28.0	16.5	22.0	...	22.0	...	...	...
Average stay in days of patients died ...	16.3	18.5	17.2	11.9	11.0	11.6	5.7	8.0	6.9	6.6	12.2	8.6	14.6	4.6	9.6	10.1	...	10.1	...	...	...
Percentage of Mortality on number treated ...	9.3	8.2	8.8	10.9	9.4	10.2	7.96	10.2	8.93	6.6	9.1	7.3	6.8	6.1	6.5	3.4	...	3.4	...	...	...
Number of Out-Patients (exclusive of attendances for repeat medicines) ...	15,084	18,163	33,187	4,895	8,489	13,384	3,573	4,195	7,768	1,759	1,613	3,372	8.3	940	1,823	1,050	329	1,379	338	141	479

GRAPH XV.
COMBINED PUBLIC HOSPITALS
BRITISH GUIANA
1938.



ADMISSIONS



DEATHS

TABLE LIX.

IN-PATIENTS DEPARTMENT, PUBLIC HOSPITALS, FROM 1st JANUARY TO 31st DECEMBER, 1938.

Class of Patients Treated.	Georgetown	New Amsterdam.	Suddie.	Bartica.	Mabaruma.	Kamakusa.	Potaro.
Seamen	53	...	...	1	3	...	...
Pay Patients	2,471	484	229	149	39	12	16
Policemen	262	33	13	1	1	3	...
<i>Race :</i>							
Europeans (other than Portuguese)...	199	27	9	4	6	...	1
Europeans (Portuguese)	648	20	23	18	13	1	...
Mixed	1,210	245	179	201	211	8	...
East Indians	5,081	1,529	1,527	102	44	...	2
Chinese	112	26	3	4	1	1	24
Blacks	7,151	1,677	594	310	65	44	...
Aboriginal Indians	124	14	97	84	218	4	...
Total	14,525*	3,538	2,437	723	558	58	27

*Exclusive of 554 patients remaining in hospital on 31st December, 1937.

OUT-PATIENTS DEPARTMENT.—PUBLIC HOSPITALS.

	George- town.	New Am- sterdam.	Suddie.	Bartica.	Maba- ruma, N.W.D.	Kama- kusa.	Potaro.
Number of Out-Patients attended to with Pauper Certificates	20,619	7,615	6,537	2,916	1,685	...	...
Number of Out-Patients attended to with Poverty Certificates	10,246	3,029	1,231	456	79	...	...
Number of Out-Patients and casualties without Certificates	2,322	2,740	...	...	59	1,379	479
Number of Out-Patients treated during the year (exclusive of repeats)	33,187	13,384	7,768	3,372	1,823	1,379	479
Number of Government Employees attended to as Out-Patients	1,848	214	154	46	33	60	13
Number of Prescriptions dispensed for In-Patients	107,848	24,276	3,223	1,292	3,527	70	35
Number of Prescriptions dispensed for Out-Patients	58,986	16,759	9,676	7,122	2,061	1,500	576

TABLE LVII.—(Continued).
HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BAKTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the year 1938.

85

TABLE LVII.—(Continued).

HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.

Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the year 1938.

[illegible]

III.--Affections of the Nervous System and Organs of the Senses.

70. Encephalitis (not including Encephalitis Lethargica)	...
71. Meningitis (not including 24 or 32)	...
72. Tabes Dorsalis	...
73. Other affections of the Spinal Cord	...
74. Apoplexy—	...
(a) Haemorrhage	...
(b) Embolism	...
(c) Thrombosis	...
(d) Unclassified	...
75. Paralysis—	...
(a) Hemiplegia	...
(b) Other Paralysis	...

TABLE LVII—(Continued).
HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In Patients) for the year 1938.

DISEASES.	P. H., Georgetown.				P. H., New Amsterdam.				P. H., Suddie.				P. H., Bartica.				P. H., N.W.D.				P. H., Kamakusa.				P. H., Potaro.				Totals.			
	Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Totals.			
	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	Cases.	Deaths				
V.—Affections of the Respiratory System.— (Contd.)	56	97	59	8	58	112	15	4	237	39	1	1	7	7	1	28	40	21	2	17	8	1	1	5	4	440	435	142	16			
	363	132	198	29	351	799	95	8	140	164	55	2	13	10	4	6	4	12	1	139	1	...	...	...	...	1,018	1,148	366	41		
	415	1,108	142	8	50	52	20	...	150	134	74	...	69	84	...	177	189	17	...	...	...	...	...	17	12	878	1,579	258	8		
	6	7	68	38	...	...	40	24	3	4	2	...	...	...	...	...	...	19	8	...	...	...	...	...	9	11	133	70			
	5	1	109	63	...	...	13	9	4	6	4	2	...	...	...	...	...	10	2	...	...	...	...	...	...	9	7	136	76		
	...	...	33	21	...	...	3	2	2	53	3	...	...	...	...	4	...	...	...	...	...	...	...	...	4	2	129	59			
	10	15	22	...	4	12	9	1	2	5	3	...	...	...	...	...	...	1	...	...	...	...	...	...	24	32	40	1			
	...	...	6	...	...	...	1	...	3	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	5	7	2			
		
		
	299	51	256	38	144	91	62	5	167	112	6	...	20	22	11	16	9	5	...	8	...	...	...	...	...	654	235	442	50		
	...	...	1	...	...	...	1	...	...	78	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
	...	...	8	7	...	...	1	1	...	...	2	...	...	...	3	2	...	...	...	...	...	...	...	...	...	...	...	12	10	...	
	4	1	26	2	7	16	1	...	3	2	...	...	1	...	1	...	3	1	...	...	...	...	...	...	...	20	23	38	4	...	
	1,263	1,455	1,021	218	690	1,147	273	54	722	315	40	...	331	398	78	13	247	251	86	13	155	49	16	1	25	17	...	4,034	1,789	339	...	
	VI.—Diseases of the Digestive System.	96	134	56	...	10	153	15	...	23	12	40	22	8	6	11	2	...	29	...	11	203	407	93
76		30	16	...	4	1	2	...	16	28	4	...	4	3	1	1	1	1	...	...	...	...	...	...	...	101	63	24	3	...	...
...		...	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...		...	16	...	5	11	...	...	3	7	...	...	10	2	2	...	...	...	...	...	...	...	...	...	...	19	16	...	...	...	...
41		108	161	...	9	34	18	...	9	15	7	...	7	2	1	4	2	1	...	6	...	...	...	...	...	81	166	188	1	...	...
67		57	29	...	1	17	5	...	14	17	...	...	6	1	...	1	3	...	...	4	...	...	...	...	...	93	98	34	3	...	...
...		...	4	...	...	...	1	1	...	3	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	2	8	4	...	...
12		9	11	...	2	2	4	...	8	9	...	...	2	1	...	1	...	1	...	...	...	...	...	...	...	25	21	16	1	...	...
3		3	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3	5	1	...	...
27		6	55	...	...	...	...	...	...	...	...	...	4	2	...	...	...	...	...	...	...	...	...	...	...	34	9	55	4	...	...
104		70	14	...	45	96	8	...	20	41	6	...	3	1	...	9	3	...	...	10	...	3	...	...	...	194	220	30	...	...	...
52		352	47	...	101	316	8	...	96	258	39	...	112	162	...	32	17	...	...	56	...	4	...	...	...	454	1,131	98	...	...	...
...		...	11	...	32	72	6	...	5	11	24	...	1	1	...	...	...	...	...	...	...	...	...	...	...	50	92	41	...	...	...

TABLE LVII—(Continued).

HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the Year 1938.

DISEASES.	P.H., Georgetown.			P.H., NewAmsterdam			P.H., Suddie.			P.H., Bartica.			P.H., N.W.D.			P.H., Kamakusa.			P.H., Potaro.			Totals.		
	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Out-Patients.		In-Patients.	Cases.	Deaths	
	M.	F.		C.	D.		M.	F.		C.	D.		M.	F.		C.	D.		M.	F.				C.	D.	M.	F.	C.	D.
VI.-Diseases of the Digestive System— (Continued)																								
113A. Diarrhoea and Enteritis— Under two years	23	28	23	9	31	61	9	5	7	...	...	...	5	6	3	...	...	...	...	...	59	95	42	14
B. Diarrhoea and Enteritis— Two years and over	73	131	259	63	27	89	68	12	13	...	...	...	7	5	6	1	...	...	...	...	107	228	316	76
C. Unclassified Diarrhoea and Enteritis	6	1	...	...	...	...	3	...	63	18	...	...	...	...	...	...	...	...	...	...	41	29	83	21
114A. Colitis	...	...	...	...	...	...	10	1	1	...	...	...	...	...	...	...	...	...	...	...	10	2	17	3
B. Ulceration	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
C. Sprue	46	11	105	5	16	32	2	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
115. Ancylostomiasis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
116. Diseases due to Intestinal Parasites— (a) Cestoda (Taenia) (b) Trematoda (Flukes) (c) Nematoda (other than Ancylos- toma)—	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ascaris	2	...	12	2	...	...	4	1	2	4	...	...	...	1	176	36	2	...	...	...	...	...	...	...
Trichocephalus dispar	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichina	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dracunculus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Strongylus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oxyuris	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(d) Coccidia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(e) Other Parasites	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(f) Unclassified	54	101	12	2	...	...	2	...	36	30	1	...	...	...	...	...	...	...	...	...	...	...	...	...
117. Appendicitis— (a) Acute (b) Sub-acute and chronic (c) Unclassified	2	...	33	3	...	...	5	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hernia	2	...	23	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
118. A. Affections of the Anus, Fistula, &c. B.—Other affections of the Intestines— (a) Enteroptosis (b) Constipation (c) Other affections	23	21	257	4	...	...	35	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
119. A. Hydatid of the Liver 120. Acute Yellow Atrophy of the Liver 121. Hydatid of the Liver 122. Cirrhosis of the Liver— (a) Alcoholic (b) Other forms	26	14	51	...	...	...	25	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
123. Biliary Calculus	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE LVII.—(Continued).

HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.

Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the year 1938.

DISEASES.	P.H., Georgetown.				P.H., New Amsterdam.				P.H., Suddie.				P.H., Bartica.				P.H., N.W.D.				P.H., Kamakusa.				P.H., Potaro.				Totals.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Totals.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	Out-Patients.	In-Patients.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
VI.—Diseases of the Digestive System— (Continued).																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
124. Other affections of the Liver—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
(a) Abscess	...	9	10	3	2	...	11	...	1	...	8	...	2	...	1

TABLE LVII.—(Continued.)

HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the Year 1938.

DISEASES.	P.H., Georgetown				P.H., New Amsterdam.				P.H., Suddie				P.H., Bartica				P.H., Kamakusa				P.H., Potaro.				Totals.			
	Out-Patients		In-Patients		Out-Patients		In-Patients		Out-Patients		In-Patients		Out-Patients		In-Patients		Out-Patients		In-Patients		Out-Patients		In-Patients		Out-Patients		In-Patients	
	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.
XII.—Diseases of Infancy—																												
160. Congenital Debility	...	...	40	24	...	...	9	25	16	...	3	3	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
161. Premature Birth	...	...	61	50	...	...	...	23	16	...	6	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162. Other Affections of Infancy	...	...	38	17	...	...	...	3	2	...	4	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
163. Infant Neglect (infants of three months or over)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	7	13	139	91	...	...	9	51	34	...	13	10	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
XIII.—Affections of Old Age—																												
164. Senility—																												
(a) Senile Dementia	...	...	3	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(b) Senile Debility	...	...	187	54	...	...	44	69	10	...	14	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	5	...	190	54	...	...	44	70	10	...	14	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
XIV.—Affections produced by External Causes—																												
165. Suicide by Poisoning,	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
166. Corrosive Poisoning (intentional)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
167. Suicide by Gas Poisoning	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
168. Suicide by hanging or strangulation	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
169. Suicide by drowning	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
170. Suicide by firearms	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
171. Suicide by cutting or stabbing instruments	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
172. Suicide by jumping from a height	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
173. Suicide by crushing	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
174. Other suicides	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
175. Food Poisoning—																												
(a) Botulism	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(b) Other	...	...	1	...	...	...	...	...	...	...	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
176. Attacks of poisonous animals—																												
(a) Snake bite	...	...	7	...	...	...	...	3	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(b) Insect bite	...	...	5	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(c) Unclassified	...	...	30	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
177. Other accidental poisonings	...	...	3	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
178. Burns (by fire)	...	...	32	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
179. Burns (other than by fire)	...	...	21	5	...	...	...	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
180. Suffocation (accidental)	...	...	56	3	...	...	...	15	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
181. Poisoning by gas (accidental)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
182. Drowning (accidental)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
183. Wounds (by firearms, war excepted)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE LVII.—(Continued).
HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In Patients) for the Year 1938.

DISEASES.	P.H. Georgetown.				P.H., New Amsterdam.				P.H., Suddie.				P.H. Bartica.				P.H., N.W.D.				P.H. Kamakusa.				P.H., Potaro.				Totals.			
	Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.	
	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.
XIV.—Affections produced by External Causes—(Contd.)																																
184. Wounds (by cutting or stabbing instruments)	...	...	39	1	41	57	...	...	...	...	67	...	3	1	7	...	18	4	20	...	24	11	3	...	8	...	1	...	94	73	137	1
185. Wounds (by fall)	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
186. Wounds (rupture of internal organs)	...	...	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
187. Wounds (by machinery)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
188. Wounds (crushing, e.g., railway accidents, &c.)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
189. Contusions—injuries inflicted by animals	...	...	3	1	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
190. Wounds inflicted on active service	...	...	...	...	...	...	...	...	...	...	22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
191. Executions of civilians by belligerents.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
192. A.—Over fatigue	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
B.—Hunger or Thirst	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
193. Exposure to Cold, Frost-bite, &c.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
194. Exposure to Heat—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) Heatstroke	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(b) Sunstroke	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
195. Lightning stroke	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
196. Electric Shock	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
197. Murder by Firearms	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
198. Murder by Cutting or Stabbing Instruments	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
199. Murder by other means	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
200. Infanticide (Murder of an infant under one year)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
201. A.—Dislocation	7	4	11	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
B.—Sprain	33	18	16	...	16	21	9	...	...	...	1	...	9	2	1	...	...	1	2	...	3	1	...	...	1	...	...	...	...	...	...	...
C.—Fracture	70	38	352	...	6	13	89	...	...	...	21	...	1	...	16	...	2	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...
202. Other external injuries	1,156	870	453	1	19	142	231	...	...	...	18	...	59	46	54	...	...	...	...	...	16	7	...	...	...	...	...	...	1,430	1,071	483	19
203. Deaths by Violence of unknown cause.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	1,298	978	1,012	52	253	233	397	5	46	18	150	4	74	49	91	2	19	8	31	...	48	19	4	...	10	...	2	...	1,748	1,305	1,087	43
XV.—Ill-Defined Diseases.																																
204. Sudden Death (cause unknown)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
205. A.—Diseases not already specified or ill-defined—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) Ascites	3	...	5	...	5	17	3	...	5	23	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(b) Oedema	9	13	5	...	11	19	2	...	...	...	...	...	6	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13	30	12	...

TABLE LVII—(Continued).
HOSPITALS—GEORGETOWN, NEW AMSTERDAM, SUDDIE, BARTICA, NORTH-WESTERN DISTRICT, KAMAKUSA, AND POTARO.
Return of Diseases (Out-Patients) and of Diseases and Deaths (In-Patients) for the Year 1938.

DISEASES.	P.H., Georgetown.				P.H., New Amsterdam.				P.H., Suddie.				P.H., Bartica.				P.H., N.W.D.				P.H., Kamakusa.				P.H., Potaro.				Totals.				
	Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Out-Patients.		In-Patients.		Totals.				
	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	M.	F.	C.	D.	Out-Patients.	In-Patients.	Deaths		
XV.— <i>Ill-Defined Diseases.</i> —(Contd.).																																	
	205. —A.—Diseases not already specified or ill-defined—(Contd.)																																
	(c) Asthenia	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(d) Shock	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(e) Hyperpyrexia	15	21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(f) Debility (excluding 160 & 164(b))	168	546	321	56	...	...	...	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	B.—Malingering	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	200	581	338	56	151	298	50	16	28	35	89	...	58	101	9	3	78	74	6	...	116	32	4	...	74	38	2	...	705	1,159	498	75	
XVI.																																	
	A.—Ophthalmic Department (Out-patients)	Included under 85 (a) —(j)				164	185	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	B.—Dental Department (O.P.)	3,078	4,338	...	...	683	822	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	C.—Casualties (O.P.)	...	...	...	...	239	566	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	D.—Not Sick	9	5	214	...	...	...	119	...	...	...	34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	E.—Undiagnosed	685	1,184	277	2	...	...	5	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	3,782	5,527	491	2	1 086	1,573	124	...	21	12	35	...	18	10	3	...	4	3	25	...	13	7	4,924	7,132	678	2
Total, of Sections I.—XVI.	15,084	18,103	15,079	1,331	4,895	8,489	3,538	363	3,573	4,195	2,437	219	1759	1613	723	53	883	940	558	36	1050	329	58	2	338	141	27	...	27,582	33,810	22,420	2,004	
Attendances—Repeat Medicines	12,432	14,038	2,202	2,729	907	1,001	653	523	148	99	90	31	21	12	16,453	18,433
GRAND TOTAL ...	27,516	32,141	15,079	1,331	7,097	11,218	3,538	363	4,489	5,196	2,437	219	2412	2136	723	53	1031	1,039	558	36	1140	360	58	2	359	153	27	...	44,035	52,243	22,420	2,004	

* Included under 153A and B, 184, 185, 187, 201A-C, and 205 (i).

TABLE LXI.

RETURN OF SURGICAL OPERATIONS.

Operations.	Public Hospital, Georgetown.		Public Hospital, New Amsterdam.		Public Hospital, Suddie.		Public Hospital, Bartica.		Public Hospital, Mabaruma, N.W.D.		Public Hospital, Kamakusa.		Public Hospital, Potaro.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Head and Neck	234	4	44	...	18	...	1	...	2	...	...	...	...	...
Upper Extremity	73	3	42	...	22	...	...	...	...	...	...	...	...	...
Lower Extremity	29	5	48	...	22	...	2	1	2	...	...	...	...	...
Thorax	120	1	6	1	4	1	...	...	1	...	...	...	...	...
Abdomen	605	23	77	4	26	...	1	1	3	1	...	...	...	...
Back and Vertebrae	1	...	1	...	1	...	...	...	...	...	...	...	...	...
Genito-Urinary System	855	20	111	4	27	1	17	...	1	...	...	...	...	...
Total	1,917	56	329	9	120	2	21	2	9	1	...	...	...	...

B.—The Mental Hospital.

348. The following information is derived from the annual report of the Medical Superintendent of the Mental Hospital.

349. The daily average number of patients was 634 (males 369, females 265) compared with 725 in 1937. There were 99 admissions (males 55, females 44) as against 95 in 1937. With the 707 patients (498 males, 309 females) remaining on January 1st, a total of 806 cases was treated during the year. The admissions from the three counties were :—

County.				Males.	Females.	Total.
Demerara	...	...	...	44	35	79
Berbice	...	...	...	7	6	13
Essequibo	...	...	...	4	3	7
Total	...	...	...	55	44	99

350. The admissions classified as to the countries of origin were :—

Country.				Males.	Females.	Total.
British Guiana	...	...	...	49	40	89
India	...	...	...	2	1	3
Barbados	...	...	...	1	2	3
China	...	...	...	1	...	1
Trinidad	...	...	...	...	1	1
France	...	...	...	1	...	1
Grenada	...	...	...	1	...	1
Total	...	...	...	55	44	99

351. There were 28 discharges (males 16, females 12) compared with 26 in 1937, and the total number of patients under treatment at the end of the year was 79 less than at the end of 1937.

352. The number of deaths was 150 (70 males and 80 females) contrasted with 92 in 1937, and the mortality rate was 18.6 per cent. as against 11.1 per cent. the previous year.

353. The principal causes of death were pneumonia, pulmonary tuberculosis, dysentery and general debility.

354. Examination of these causes shows that the excess numbers due to the principal causes are as follows :—

Primary pneumonia	...	...	19
Pulmonary tuberculosis	...	...	14
Senility in the age group 70—75	...	...	11
Gastro-intestinal diseases of the dysentery group	...	...	14
			58

355. There appears to be no doubt that overcrowding combined with the unprecedented weather conditions has resulted in a marked exacerbation of the incidence of primary pneumonia, dysentery, and tuberculosis.

356. The chief diseases treated were malaria, pneumonia, pulmonary tuberculosis and other lung diseases, filariasis, diarrhoea, dysentery, and general debility.

357. The expenditure for the year was \$68,923.82 compared with \$66,870.97 in 1937, and the revenue \$2,088.88 compared with \$1,948.14 in 1937.

358. The per caput cost per diem was 28.9 cents as against 23.7 in 1937.

359. About 45 per cent. of the patients were engaged in some form of occupation and the value of their labour in such occupations as baking, gardening, tailoring, shoemaking, washing, printing, carpentry, woodcutting, was estimated at \$25,669.75.

360. The table below furnishes the accommodation in the various wards of the hospital with classification as to type of patient :—

TABLE LXII.

Division.	No.	Name of Block.	Accommodation.		Class of Patients.
			Authorised.	Actual Number of Patients.	
Male	417	Ward 1	23	17	Trusted.
		Wards 2, 3, and 4	82	81 + 16 sleeping at Annex.	Dangerous and refractory.
		Ward 5	71	69	Chronic Creole.
		Ward 6	74	47	Chronic East Indian.
		Ward 7	38	37	Quiet East Indian.
		Ward 8	41	30	Quiet East Indian.
		Wards 9 & 10	55	56	Sick and infirm.
		Ward 11	...	...
		Ward 12	33	30 (14 + 16)	Criminal.
Female	348	Ward A	67	60	Chronic Creole.
		Ward B	66	29	Chronic East Indian.
		Ward C	52	22	Dangerous and dirty.
		Ward E	81	52	Doubtful and dirty.
		Wards F and G	54	70	Sick and infirm.
		Cottage	28	28	Convalescent and trusted.
	765		765	628	

C.—Public Dispensaries.

361. In addition to the out-patient dispensaries attached to the public hospitals in Georgetown, New Amsterdam, Suddie, Bartica, Mabaruma, Kamakusa, and Potaro, and the Government public dispensary at George Street, Georgetown, there are thirteen Government dispensaries in charge of qualified sicknurses and dispensers, situated in remote, yet populous river districts, and in the diamond and gold bearing areas. In the majority of these outlying dispensaries the work done by the nurse-dispenser is supervised by the Government Medical Officer of the adjoining district.

362. The following table gives the number of cases treated, with expenditure and revenue :—

TABLE LXIII.

Dispensary.	Paying Patients.			Police Patients.			Pauper Patients.			Expenditure.	Revenue.
	New Cases.	Repeats.	Total.	New Cases.	Repeats.	Total.	New Cases.	Repeats.	Total.		
No. 1 George Street, Charlestown ...	902	435	1,337	14	...	14	1,599	13,606	15,205	\$ 2,094 74	\$ 320 88
Demerara River (Christianburg) ...	934	171	1,105	68	17	85	753	98	851	951 38	515 86
Canal No. 1 Polder ...	1,120	59	1,179	...	...	...	28	2	30	*	275 76
Canal No. 2 Polder ...	1,081	68	1,149	...	...	...	100	4	104	1,171 14	282 96
Berbice River (Ida Sabina) ...	295	15	310	...	...	...	1,075	81	1,156	1,232 56	110 72
Mara ...	80	8	88	14	4	18	494	62	556	1,356 61	25 59
Leguan ...	2,402	63	2,465	51	9	60	443	25	468	877 25	637 08
Parika ...	86	14	100	27	3	30	42	17	59	†	24 00
Wakenaam ...	1,832	20	1,852	55	2	57	1,451	32	1,483	842 68	467 72
Essequebo River (Supenaam) ...	1,006	136	1,142	...	...	...	1,256	196	1,452	1,383 84	356 74
Anna Regina ...	950	81	1,031	35	4	39	7,040	1,336	8,376	1,150 64	248 64
Pomeroon River (Charity) ...	978	65	1,043	17	4	21	3,281	230	3,511	1,609 50	355 16
Moruca River (Acquero) ...	14	...	14	...	...	...	3,954	1,153	5,107	1,309 89	3 36
Enachu ...	123	5	128	2	1	3	934	46	980	‡ 804 19	135 00

* Supplies are obtained from Canal No. 2 Polder.

† Supplies are obtained from Leguan Dispensary.

‡ Salary, etc., of Dispenser.—Supplies are obtained from the Public Hospital, Kamakusa.

X.—PRISONS.

363. *Georgetown Prison.*—The general health of the prisoners was good. During the latter part of August influenza was evidenced among the prisoners. Isolation of these cases and disinfection of all the cells did not retard its spread and, in a week's time, the hospital accommodation was taxed to the limit and it was necessary to convert two of the association wards of the prison into temporary hospital wards.

364. Night nursing became an urgent necessity and the services of a night dispenser was acquired.

365. The epidemic gradually abated in mid-September. Fortunately, no deaths occurred, but one case developed pulmonary tuberculosis, and was transferred to the Public Hospital, Georgetown.

366. The sanitary arrangements, ventilation and drainage were satisfactory the water supply was adequate and the food supplies adequate and of good quality.

367. The landings of the wood and brick prisons have been furnished with flushing bowls where prisoners now empty their night soil buckets, thereby eliminating an insanitary practice.

368. One of these bowls is also installed in the north prison and another in the tailors' shop, and a urinal has been constructed for use at the infirmary.

369. Lighting improvements have been installed in the brick prison.

370. Forty-one cases came under medical observation, *i.e.* 28 males and 13 females. Of these 17 males and 8 females were certified not insane, and 11 males and 5 females insane.

371. Injections administered during the year were as follows :—

A.T.S.	...	...	8
Adrenalin, HCL	...	...	9
Fouadin	...	...	65
Hyocine, HBR	...	...	2
Manganese Butyrate	...	...	21
Neo-Hepatex	...	...	21
N.A.B.	...	...	63
Quinine, HCL	...	...	1
Salygran	...	...	5
Emetine, HCL	...	...	11

372. The number of venereal cases treated during the year was :—

Males.	Females.	Total.
95	—	95

373. Thirty-seven blood specimens for Kahn's test were sent to the laboratory for examination, and of these, twenty-two were found to be positive and fifteen, negative.

374. These specimens were all of convicted prisoners and are classified as under :—

Syphilis	...	...	...	22
Chancroids	...	...	...	15
Granuloma	...	...	...	6
Gonorrhoea	...	...	...	52

375. In addition to the above the following are cases of remand prisoners who were also treated during the year :—

Chancroids	...	...	...	5
Granuloma	...	...	...	3
Urethritis	...	...	...	6

376. There were 143 sittings for dental extractions, and 179 teeth were extracted.

377. There were two cases of leprosy during the year under review. They were certified in the usual manner and transferred to the Leprosy Hospital at Mahaica.

378. *New Amsterdam Prison.*—The general health of the prisoners was good.

379. The sanitary arrangements and drainage were satisfactory. The water supply was good. Potable water was stored in screened tanks and vats. There was also a good supply of creek water for sanitary requirements.

380. Food supplies were adequate and of good quality.

381. The number of cases of venereal diseases treated was as follows :—

	Male.	Female.
Gonorrhoea	3	0
Granuloma	4	2
Chancroids	2	0

382. The number of injections given was as follows :—

A.T.S.	...	...	2
Tartar emetic	...	...	9

383. Dental extractions were as follows :—

Male.	Female.
6	1

384. The following table shows the hospitalization, etc. of prisoners in the Georgetown and New Amsterdam Prisons :—

Prison.	Average daily number of prisoners.	Average daily number in prison hospital.	Total number of admissions.	Number of deaths.	Number transferred to Public Hospital.	Number transferred to Mental Hospital.
Georgetown ...	223.2	6.22	109	1	10	1
New Amsterdam...	58.55	.12	4	...	1	...

385. The principal diseases treated were influenza, malaria, and venereal diseases. The total number of out-patient attendances was 10,350 compared with 10,358 in 1937.

XI.—THE ALMS HOUSE.

386. Accommodation is provided for 808 inmates—514 males and 294 females. The number of inmates on the 1st January, 1938, was 535 males and 321 females. The number admitted during the year was 669—451 males and 218 females, while the daily average was 855.

387. There are five infirmary wards providing accommodation for 316 patients. 1,564 cases were treated in the infirmary wards—1,094 males and 470 females. The daily average number of infirmary patients was 227 males and 151 females. The principal diseases treated were—Bright's disease, general debility, diseases of the heart, chronic bronchitis, diarrhoea, and hemiplegia.

388. During the months of August and September there was an epidemic of influenza among the inmates.

389. The number of ulcer cases at the end of the year was 136—95 males and 41 females.

390. 111 minor operations were performed—81 males and 30 females.

391. 154 injections were given during the year :—

Tartar emetic	...	...	3
Fouadin	...	...	150
Billon	...	...	1

392. The total number of deaths was 313—182 males and 131 females, the death-rate being 20.5 per cent. of the total number of inmates compared with 19.3 per cent. in 1937.

393. The number of inmates remaining in the institution on 31st December, 1938, was 850—536 males and 314 females, the chief causes of detention being senility, hemiplegia, ulcers, Bright's disease, blindness, and diseases of the heart.

394. The following table shows the admissions, deaths, etc. for the last ten years :—

TABLE LXIV.

Year.	Total Deaths.	Total persons in Alms House during the year.	Death-rate per cent.	Number of cases of Diarrhoea.	Number of cases of Dysentery.	Number of deaths from Diarrhoea and Dysentery.
1929	286	1,429	20.01	148	69	38
1930	203	1,379	14.7	54	10	6
1931	219	1,272	17.2	52	6	4
1932	241	1,318	18.2	20	3	7
1933	282	1,307	21.5	116	13	16
1934	269	1,389	19.4	50	7	9
1935	223	1,444	15.4	32	2	2
1936	268	1,519	17.6	9	4	3
1937	284	1,471	19.3	20	...	3
1938	313	1,525	20.5	61	...	24

395. *General Remarks.*—The wards, offices and grounds were kept in good condition throughout the year and the sanitary arrangements were satisfactory.

XII.—THE ONDERNEEMING INDUSTRIAL SCHOOL.

396. The following information is derived from the report of the medical officer, which is published with that of the superintendent.

397. The general health of the boys was satisfactory.

398. The following table shows the statistical figures for the years 1936, 1937, and 1938 :—

	1936.	1937.	1938.
Daily average number of boys in school ...	80	77	50
Daily average number of boys sick ...	1.7	.8	.14
Percentage of sick to daily average number of boys ...	2.2	1.1	0.3

399. There were 90 admissions to the infirmary during the year ; most of these cases on admission suffered from malaria fever, sprains, chronic ulcers, otorrhoea haematoma, and dermatitis. The number of cases referred to the Public Hospital, Suddie, was 22, suffering from malaria fever, incised wounds, abscesses, analwarts, and urethritis, which were present on admission. Prophylactic treatment with anti-tetanic serum for minor injuries was given in 30 cases.

400. 20 boys were admitted to, and 26 boys were discharged from, the institution during the year. No boys died during the year.

401. There were 21 cases of malaria. There were no cases of filaria.

402. No vaccinations were performed during the year.

403. Routine examination for helminth infection is carried out after admission of boys into the school and none showed any sign of infection.

404. A more satisfactory system of disposal of urine in the dormitories is required.

405. The grounds have been well kept and the drains maintained in good order.

XIII.—SUGAR ESTATES.

406. There was no change during the year in the arrangements for the medical and sanitary care of sugar plantations.

407. On a majority of the plantations, members of the staff and their families are attended by private practitioners, whilst the Government Medical Officer of the district is in charge of the hospital, the labourers and the sanitation of the compound.

408. Twenty-two out of thirty-one plantations provide and maintain hospitals and dispensaries for their labourers.

409. The total number of Births was 2,055 as against 2,379 in 1937. The infant mortality figure was 140.1 as against 111.3 in 1937. There were 1635 deaths as compared with 1,343 in 1937. The principal causes of death were :—

CAUSES OF DEATH.			NUMBER OF DEATHS.
1. Malaria	...	...	173
2. Lobar Pneumonia	...	...	109
3. Chronic Bronchitis	...	...	94
4. Diarrhoea and Enteritis	...	...	72
5. Broncho-pneumonia	...	...	62
6. Infantile debility, Icterus and Sclerema	...	...	54
7. Asthma	...	...	44
8. Bright's Diseases	...	...	42
9. Heart Diseases	...	...	40
10. Influenza	...	...	38
11. Premature Birth	...	...	28
12. Acute Bronchitis	...	...	18
13. Enteric Fever	...	...	16
14. Acute Nephritis	...	...	14
15. Dysentery	...	...	10

410. The following is a summary of the improvements effected during the year :—

HOSPITAL.	IMPROVEMENTS COMPLETED.
Springlands	...4 new cottages and 2 new ranges of 10 rooms each were erected
Skeldon	...17 new cottages and 1 new range of 10 rooms were erected. 3 new latrines of the over-trench type were erected. Galleries were added to 28 cottages.
Port Mourant	... <i>Hospital</i> —12 iron spring cots were provided. ... <i>Cottages</i> —8 two-family cottages were erected. ... <i>Latrines</i> —2 six-room over-drain latrines were erected. ... <i>Water Supply</i> —2,900 feet everite piping were laid and 7 stand-pipes were erected.
Albion	... <i>Hospital</i> —1 iron spring cot was provided. ... <i>Latrines</i> —10 over-drain latrines were erected. ... <i>Water Supply</i> —8,100 feet everite pipes were laid down.
Rosé Hall	...4 five-room and 1 ten-room ranges were erected. 9 new pit latrines were erected and 3 over-trench latrines repaired.
Providence (Berbice)	...4 five-room ranges were erected.
Bath	... <i>Hospital</i> —A new kitchen with improved type of oven was provided. A new crèche was erected. ... <i>Ranges</i> —5 new ranges were built. ... <i>Cottages</i> —7 cottages were reconstructed on 3' pillars with 7' gallery and kitchen attached. ... <i>Latrines</i> —2 over-trench latrines were erected.
Blairmont	... <i>Hospital</i> —A new concrete post mortem table was provided and electric light was installed in the mortuary. ... <i>Ranges</i> —3 new ranges of 6 sections each (each section consisting of 3 rooms) were erected. ... <i>Cottages</i> —2 new cottages on 6' pillars containing gallery, hall and 2 bedrooms, with glass windows and with separate kitchen were erected—18 cottages were reconstructed on 3' pillars and front galleries and kitchens added. ... <i>Latrines</i> —New latrines—8 compartments—over concrete trough, flushed by factory discharge water, and 3 "Doulton" patent urinals were erected in the factory.
Cane Grove	... <i>Hospital</i> —Kitchen was renovated, 12 iron cots were supplied and wooden cots painted.
Non Pareil	... <i>Hospital</i> —Female ward, maternity ward, female nurse's quarters, dispenser's quarters, dispensary, consulting room, kitchen and latrines were rebuilt. Well water laid in in both wards. ... <i>Ranges</i> —21 cottages and 3 ranges were erected. ... <i>Latrines</i> —11 over-trench latrines were erected. ... <i>Water Supply</i> —Piping laid down to certain ranges.
Enmore	... <i>Latrines</i> —2 pit and 2 over-trench latrines were erected. ... <i>Water Supply</i> —Pipe lines for carrying artesian well water to some of the ranges were laid down.
Lusignan	... <i>Ranges and Cottages</i> —1 five-room new type range—(60' x 24') on 3' pillars and separate kitchen (7' x 7') for each room were erected. 19 family cottages and 1 Hindu temple were erected. ... <i>Latrines</i> —21 cesspit latrines were erected. ... <i>Water Supply</i> —Artesian well water piped and distributed to hospital compound and to new residential area.
La Bonne Intention	... <i>Hospital</i> —Repaired and painted throughout. ... <i>Ranges</i> —4 five-room new type ranges with separate kitchens were erected. ... <i>Water Supply</i> —Extension of pipes from the artesian well to various parts of the yard.
Vryheid's Lust	... <i>Ranges</i> —1 five-room new type range with separate kitchens was erected.
Ogle	... <i>Hospital</i> —A new kitchen was erected.

HOSPITAL.	IMPROVEMENTS COMPLETED.
Versailles and Schoon Ord...	<i>Hospital</i> —Repaired and painted. <i>Ranges and Cottages</i> —3 new ranges on 3' pillars with kitchen and gallery enclosed were erected. 1 cottage on 4' pillars with kitchen attached was erected. <i>Latrines</i> —4 pit latrines were erected. <i>Water Supply</i> —Artesian pipeline has been extended 2,586 feet with 4 new taps.
Wales	... <i>Hospital</i> —Maternity ward was renovated and painted and 5 new infant cots provided. <i>Ranges</i> —3 five-room new type ranges on 3' pillars, with kitchen enclosed, were erected. <i>Latrines</i> —9 new latrines were erected.
Leonora	... <i>Ranges and Cottages</i> —2 new cottages were erected; 2 ranges were raised and repaired. <i>Latrines</i> —3 over-drain latrines were erected and 108 doors fitted to existing latrines. <i>Water Supply</i> —Artesian well pipeline was extended to Groenveldt pasture.
Uitvlugt	... <i>Ranges</i> —4 four-room, 1 five-room and 1 eight-room new type ranges, with kitchens attached, were erected. <i>Latrines</i> —7 over-drain latrines were erected.
De Kinderen	... <i>Ranges</i> —1 ten-room and 1 five-room new-type ranges were erected. <i>Latrines</i> —6 over-drain latrines were erected.

411. The total number of patients admitted to estate hospitals was 30,563 as compared with 24,285 in 1937. There were 1,056 deaths as against 851 in 1937. 10,157 patients were treated at the dispensaries of these hospitals as against 6,336 in 1937.

412. *Malaria*—14,600 cases were treated in hospitals with 173 deaths. The average annual figures for the previous five years were 8,131 cases and 120 deaths.

413. The distribution in counties during 1938 was :—

County.	Cases Malaria.	Deaths Malaria.
Berbice ...	6,666	81
Demerara ...	7,934	92

414. *Bowel Diseases*.—The following table shows the number of cases and deaths from enteric fever and "other intestinal diseases" (dysentery, diarrhoea and enteritis) during the years 1934–1938 :—

Year.	Enteric Fever.		Other Intestinal Diseases.	
	Cases.	Deaths.	Cases.	Deaths.
1934 ...	156	28	1,251	87
1935 ...	123	20	969	50
1936 ...	142	18	808	49
1937 ...	150	19	1,164	82
1938 ...	115	16	1,151	82

415. The number of reported cases of all forms of pneumonia was 553 with 188 deaths.

416. *Drainage, bonification and housing*.—Greater stress is annually being laid on the importance of adequate drainage and the preparation of the land for building purposes—clearing, raising and levelling—prior to the actual erection of labourers' cottages or ranges. The procedure adopted is in conformity with the Public Health Ordinance. A plan is first prepared showing the proposed lay-out, means of access to the area or lots, and the method of drainage of the land. After approved by the Central Board of Health, the works specified on the plan are thereafter executed,

and a second certificate is given. The usual building application form is then submitted.

417. Estate yards proper were originally laid out for building purposes under the Immigration Ordinance and a general policy with respect to estate ranges has been adopted by the Central Board of Health.

418. The Central Medical Research Laboratory operating under the *aegis* of the contributing members of the British Guiana Sugar Producers' Association continues to extend its very valuable work amongst the large section of the population employed in this industry. Dr. G. Giglioli, the Director, and Mr. J. Jack, the Chief Sanitary Officer, have been engaged upon investigative and control work concerned with malaria on the various estates. Other activities associated with the control of the enteric group of fevers by immunization, as well as the general problems of conservancy, have also been included in the work over the year. It is a pleasure to record the cordial relations, that exist between this Laboratory and the Medical Department, from which unquestionable benefits for the whole Colony cannot fail to accrue.

XIV.—MINING.

A.—Mazaruni Diamond Fields.

419. The resident staff consists of :—

- 1 Senior Dispenser,
- 1 Junior Dispenser.
- 1 Mechanic for motor engine.
- 2 Boathands,
- 1 Scavenger.

420. The hospital of eight beds, with dispensary, is situated at the headquarters station, Kamakusa. An out-station dispensary under the charge of a dispenser is maintained at Enachu. The senior and junior dispensers continued to make routine inspections of their districts.

421. The average population of the district during the year was 4,082.

422. The health of the district was fair. No disease assumed epidemic form. Malaria was still the prevailing disease. During the wet weather anopheline mosquitoes were much in evidence at Enachu and its surroundings. The importance of quinine prophylaxis was stressed and totaquina tablets freely distributed.

423. Weather conditions were responsible for mild cases of influenza. Several cases of debility and diseases of the digestive system were also treated, the majority being persons who have spent long unbroken periods in the diamond fields.

424. Fresh vegetables, poultry and beef occasionally are procurable, also fish during the dry season.

425. The treatment of cases of venereal diseases entering the district and of those infected within the district is still palliative only. All infected persons are advised to travel to the Public Hospitals, Bartica and Georgetown, for effective treatment.

426. The dispenser at Enachu pays weekly visits alternating fortnightly at important points above Enachu; when possible, the senior dispenser pays weekly visits to Eping-Perenong and intermediate points. Quarterly tours were made to all the navigable areas by the senior dispenser. On these tours, which lasted ten to fourteen days, the junior dispenser at Enachu performed duty at Kamakusa. The weekly visits of the senior dispenser depend on the absence of bed-cases at the hospital.

427. Several tours of inspection were made through the district during the year, sanitary works were done by way of inspecting latrines and getting shops, camps,

logies, and their respective surroundings cleaned and cleared of all broken bottles, empty tins, refuse, etc. Inspections of foodstuffs were also carried out.

428. There were no births registered during the year.

429. The number of deaths registered was 37 compared with 36 in 1937. The causes were malaria fever 3, drowning 2, pneumonia 3, diarrhoea 4, dysentery 1, other causes 19, unknown 5.

B.—Potaro Hospital and Dispensary.

430. The hospital-dispensary is situated at 11½ miles Potaro and has accomodation for 6 beds. The staff consists of a sicknurse-dispenser, a nurse (as occasion arises) a porter, a boat-captain, and a boat-hand.

431. The health of the district was fair. The prevailing diseases were malaria and debility. 27 cases (male) were treated in hospital with no deaths. The number of out-patients treated was 479 (338 males and 141 females).

432. Tumatumari and Garraway Stream were visited fortnightly, and quarterly visits were paid to Kangaruma. Amatuk was visited twice during the year.

C.—McKenzie Hospital.—Demerara Bauxite Co., Ltd.—Demerara River.

433. The staff consists of :—

- 1 Medical Officer.
- 3 Dispensers (1 at Three Friends and Trevern Mines).
- 4 Nurses (1 male).
- 4 Probationers.
- 2 Attendants.
- 7 Ward Maids.
- 2 Cooks.

434. The number of beds available in the hospital is 67.

435. 911 cases, with 20 deaths, were treated in hospital during the year.

436. The number of out-patients treated was 14,239.

437. The following is a return of the work done in the pathological laboratory :—

Blood.—Secretions—Excretions.

Blood films for malaria	207
Blood films for filaria	...	...	36
Urine analyses	...	...	901
Stool examinations for amoebae	...	...	101
Sputum examinations for tuberculosis	...	...	53

438. Poverty and pauper cases from the surrounding areas are admitted and treated in the Company's hospital. By arrangement with Government a fee of 30 cents per diem is paid for in-patients and 6 cents per attendance for out-patients. The amount so paid during 1938 was \$290.10.

D.—British Guiana Consolidated Gold Fields.—Potaro.

439. The resident staff consists of a medical officer and a sicknurse-dispenser.

440. A "casualty post" is maintained for the treatment of inpatients.

441. 2,791 cases were treated during the year made up as follows :—

Members of the staff	...	...	40
In-patients	...	...	74
Out-patients	...	...	2,677

442. There was one death.

443. The principal disease treated was malaria.

444. General health conditions were fair.

445. Articles of food and drink were examined regularly and found to be fair.

446. Water supply and drainage were satisfactory.

447. Anti-mosquito and anti-malarial measures were carried out regularly and latrines were oiled every other day.

XV.—HINTERLAND SETTLEMENTS.

448. Free medicines were supplied to a number of Aboriginal Indian Stations and Mission Stations at a cost of \$189.52. Recognition is given to the willing and free medical attention paid to the inhabitants of these hinterland areas, particularly at Mission Stations, by those in charge, who in the course of years have acquired a very practical and valuable knowledge of elementary therapy, both medical and surgical, and in whom the native places a trust and confidence perhaps not otherwise obtainable.

449. Periodical visits are made by the Government Medical Officer, Skeldon, to a settlement at Orella up the Corentyne River, and by a Government dispenser to Santa Mission, Kamoonie Creek, Demerara River.

450. In order to afford some measure of medical aid to residents in the Rupununi, a Government dispensary was established at Kurupukari in September, 1937, and a dispenser stationed at this point with a suitable supply of drugs and medical comforts. This dispenser also teaches in a primary school established at this post, and performs duty as cattle-trail clerk. During school holidays, he is expected to undertake short tours on first aid duty to the settlements in this area.

451. The whole question of organised medical services for Aboriginal Indians is under consideration and it is hoped that a scheme of this nature will become operative in the near future.

XVI.—METEOROLOGICAL.

452. The rainfall during the year, as registered at the Botanic Gardens- (Georgetown), was 119.00 inches as against 92.16 in 1937, and the mean percent age of humidity was 82.6 inches as against 81.6 inches in 1937.

453. The mean of the four recording stations in Georgetown was 118.43 inches as against 89.34 in 1937.

454. The following is the meteorological return for the year which was kindly supplied by the Director of Agriculture :—

METEOROLOGICAL DATA TAKEN AT THE BOTANIC GARDENS, GEORGETOWN.

Month.	TEMPERATURE.						RAINFALL.		WIND.	
	Solar Maxi- mum.	Mini- mum on Grass.	Shade Maxi- mum.	Shade Mini- mum.	Range.	Mean.	Amount in Inches.	Per cent of Humi- dity.	General Direc- tion.	Average Force Velocity M.P.H.
January ...	145.6	72.7	84.1	75.6	14.0	79.8	13.34	82.5	N.E.	7.25
February ...	144.3	73.5	83.7	76.5	14.0	80.1	15.10	85.3	N.E.	8.26
March ...	144.3	72.9	83.5	75.7	12.5	79.6	13.76	82.9	N.E.	4.33
April ...	145.3	73.7	84.4	76.3	13.0	80.3	7.95	82.0	N.E.	7.32
May ...	143.9	74.0	84.9	76.2	13.0	80.5	11.17	84.8	N.E.	5.68
June ...	143.1	72.9	84.5	75.3	14.0	79.9	13.17	84.3	N.E.	5.27
July ...	145.6	72.7	85.1	74.9	15.0	80.0	12.74	83.6	N.E.	4.03
August ...	148.5	73.2	86.3	75.0	18.0	80.6	14.96	83.5	N.E.	3.30
September ...	148.1	74.3	88.2	76.8	16.0	82.5	1.85	80.0	N.E.	4.69
October ...	148.5	73.5	88.2	76.4	19.0	82.3	3.48	78.9	N.E.	5.07
November ...	147.5	73.8	87.3	76.9	17.0	82.1	5.12	81.4	N.E.	5.18
December ...	147.8	72.6	85.5	75.6	15.0	80.5	6.36	82.2	N.E.	5.23
Mean ...	146.0	73.3	85.5	75.9	...	80.7	119.00	82.6	...	5.47

Georgetown—Registered Mean Rainfall for the year 1938=118.43 inches.

455. The following reports are appended :—

Appendix I—

- (a) Report of the Government Central Laboratories.
- (b) Report on Nutritional Anaemia in British Guiana by the Government Bacteriologist.

*Appendix II—Malaria in British Guiana by G. Giglioli, M.D. (It.) M.R.C.P. (Lond.)
D. T. M. & H. (Eng.)*

Part I.—The Anopheline Mosquitoes of the Colony.

Part II.—Which of the local anopheline species are responsible for the transmission of malaria.

Part III.—Breeding habits of *A. darlingi*—Natural factors which limit the distribution of this species and of malaria.

Part IV.—The distribution of malaria on the coastlands—Genesis of malarial epidemics.

Appendix III.—Supplement—Vital Statistics—1900-1937.

NORMAN M. MACLENNAN,
Director of Medical Services.

APPENDIX I.

(4)

ANNUAL REPORT OF THE GOVERNMENT CENTRAL LABORATORIES FOR THE YEAR 1938.

The Laboratory was without a Pathologist for the first eight months of the year. During this period Dr. E. G. Hamilton Payne carried out the duties of Pathologist and Bacteriologist in addition to his normal duties.

Dr. P. A. Clearkin arrived on first appointment on 28th August, and took up the duties of Pathologist and Bacteriologist.

TECHNICAL STAFF.

Mr. I. Singh.

Mr. E. A. Singh,

Mr. J. O. Morgan.

Clerk.—Mr. M. N. Fernandes acted until June when he was seconded for duty with the Government Public Health Department, and was replaced by Mr. I. C. Sobryan until the end of the year.

Laboratory Attendant—Mrs. Matilda Duncan.

The volume of routine work is a heavy tax on this small staff. In particular it is to be noted that the officer in charge is single-handed and when he is ill or goes on leave extemporised arrangements have to be made to carry on the work. This is most unsatisfactory and it must be recognised that the running of a laboratory is a highly specialized task and requires an officer with a highly specialized training. As the practice of medicine becomes more scientific the calls on the laboratory become more exacting and in consequence the officer in charge must have a long training in scientific medicine. It is not usual at the present time to find a young practitioner who has been able to specialize in all branches of laboratory practice such as Pathology, Public Health Bacteriology, Clinical Bacteriology, Haematology, Parasitology, Biochemistry and Medico-legal work. Each of these subjects is, today, a speciality and as a rule at least, two men, each of whom has specialized in different branches, is required for a laboratory such as this.

Another weak link in the laboratory is the provision for washing and cleaning. One attendant is quite insufficient for the purpose. Inadequate cleaning of glassware is responsible for false and misleading results, and the more fragile pieces of apparatus such as haemocytometer pipettes cannot be entrusted to a single individual responsible for working at high pressure to keep up the supply of clean beakers, flasks, and test tubes for general use in the laboratory. In particular the cleaning of over six hundred small tubes per week, used for Wasserman reaction, cannot be performed adequately by only one attendant. When it is realised that in addition to the cleaning of glassware and apparatus the single attendant has to wash, scrub, and take responsibility for the general cleanliness of the premises, it will be admitted that the task is too great for one individual.

The great bulk of the work is clinical pathology for the Public Hospital, Georgetown, and other institutions in the city. Public Health work forms only a relatively minor part. Should a sudden demand be made for even a moderate amount of Public Health investigation, the laboratory could not meet it without curtailing routine investigations for the hospitals. This is not as it should be, and when increased attention is paid to the Public Health, as must be done soon, there will have to be a corresponding expansion of the laboratory personnel and equipment. The possibility of an early introduction of a pure water supply for the capital is only one of the directions in which an expansion of the public health services will require an extension of the laboratory activities, as it will necessitate regular and systematic examination of the water supply in order to anticipate any failure in the methods used for purification. Malaria surveys, investigation of outbreaks of enteric, and tracing carriers of diphtheria are other directions in which public health work must increase and necessitate a corresponding increase expenditure on the laboratory service.

Even with the present staff the laboratory cannot meet all the demands made upon it: the number of Wasserman tests and the number of blood counts has had to be limited.

The equipment of the laboratory is far short of what is required, but it is not proposed to offer any further comments on this point as a sum of money has been received for equipment which should help to remedy the more glaring defects. With increasing demands, however, further expenditure will be required.

As regards premises, a new laboratory has been built but is not yet complete. The necessary funds for the purpose have been voted and it is hoped to enter into the new premises during the course of the current year.

The district hospitals are deprived of the advantages of a laboratory service. Except for Wasserman tests or a Widal, little work is done for them. It is hoped to remedy this state of affairs in the near future by training selected dispensers in elementary laboratory technique and posting them to various district hospitals. One has already been selected for training and will be posted to the Best Hospital. Each of the district hospitals should have a small laboratory controlled by the medical officer in charge, with a dispenser trained in laboratory work under his direction. The development of this system will result in a greater volume of work for the Central Laboratory as the dispenser-technician will be trained in the methods of obtaining specimens and forwarding them for more skilled examination. Moreover, it will result in a greater and much needed liaison between the Central Laboratory and the district medical officers.

ROUTINE EXAMINATIONS.

The total number of routine examinations done during the year was 18,049. Of these, 9,840 were in connection with venereal disease. This is a very high percentage and it was found necessary, in the interests of the other medical services, to limit the number of Wasserman tests to 150 per week.

Blood examinations for the presence of malaria parasites are not so numerous as would be expected and very few are received from the private practitioners in the city. Possibly, one reason for this was that, unlike other examinations made in the interests of public health, such examinations were chargeable. It was therefore considered advisable towards the end of the year, that in the public interest, such examinations should be carried out free of charge, and this was done unofficially. There has not been time yet to determine what effect this has had on the number of samples received, but it is hoped that it will result in an increase. If all practitioners sent blood smears to the laboratory from every suspected case of malaria, together with information regarding the place of residence of the patient, a spot map of the distribution of malaria in the township could easily be prepared. There is not, as far as I am aware, any accurate information available as to the incidence and distribution of malaria in Georgetown.

Benign tertian parasites were present in over 69% of the positive slides, and subtertian in over 28%. It is a remarkable fact that gametocytes have never been reported during the year.

The demand for total blood counts was greater than could be dealt with by the staff of the laboratory, and the number which could be done satisfactorily had to be fixed at not more than two per day.

BLOOD EXAMINATIONS.

A.—*Microscopic.*

(1). Parasitological,

Benign tertian malaria parasites were found in 331 samples.

Subtertian	"	"	"	"	134	"
Quartan	"	"	"	"	2	"
Benign and subtertian	"	"	"	"	7	"
Malaria parasites unidentified	"	"	"	"	3	"
Microfilariae	"	"	"	"	11	"

Total positive 488

Total negative 1626

Total number of specimens received 2114

(2). Blood counts.

Differential leucocyte count	418
Total red and white cell count	390
Total leucocyte count	4

Total number of specimens received 812

Until November, the total blood count consisted of red and white cell count, percentage of haemoglobin and differential leucocyte count. Early in November the addition to the equipment of the laboratory of a new and powerful centrifuge enabled the Mean Corpuscular Volume and Mean Corpuscular Haemoglobin Concentration to be estimated; these determinations were therefore done on every sample and in December, a reticulocyte count and the Van den Berg reaction were also done as a routine.

The centrifuge was carefully tested for its capacity to pack cells to a constant volume and

it was found that the cell volume was constant at the end of an hour; this was then adopted as the standard time for determination of the volume of packed cells.

Samples of blood were received in oxalate tubes carefully prepared in the laboratory and issued as required.

All the counts in the last two months of the year were done by the Pathologist himself and in the course of this work it was found that a macrocytic anaemia, distinct from the anaemia of pregnancy, was far from uncommon. Careful records of all these cases are being kept in the hope that when sufficient number are obtained an analysis may indicate the cause. In the meantime a short analysis of the cases seen up to the end of the year is appended to this report.

It has not been possible to do a Price-Jones curve yet, but it is hoped to do so on a number of cases during the current year. Bone marrow biopsies have not been done as time does not permit of it.

B.—Serological.

(1) Agglutination.

Sera Agglutinating B. typhosum	...	...	104
" " " paratyphosum A	...	...	3
" " " paratyphosum B	...	...	5
" " " paratyphosum C	...	...	4
" " " typhosum and paratyphosum A	...	...	2
" " " paratyphosum A and B	...	...	2
" " " typhosum and paratyphosum A and B	...	...	2
Total positive sera			122
Total negative sera			229
Total number of specimens received			351

All sera, in addition to the organisms mentioned, were tested against *Brucella abortus* and *Brucella melitensis*. Towards the end of the year both "H" and "O" agglutinogens were used.

(2) Complement Fixation Reaction.

++	+	±	Negative.	Total.
1592	268	33	5001	6904

As in former years the Harrison technique was used.

C.—Blood Chemical.

Samples of blood for urea	...	...	224
" " " " sugar	...	...	61
" " " " chlorides	...	...	2
Glucose tolerance tests	...	...	9
Van den Berg reaction	...	...	20
Total			316

D.—Blood Culture.

B. typhosum was isolated from	18 samples
Streptococci	5 "
Gonococci	1 sample
Negative	262
Total	286

The case from which the gonococcus was isolated was interesting. The patient had been complaining for six weeks of fever with rigors, and for ten days of præcordial pain. Quinine had no effect on the fever. Two days after admission to hospital a small gram negative coccus was isolated from the blood. This coccus gave all the cultural reactions of the gonococcus. A diagnosis of subacute bacterial endocarditis was made though there were no petechial haemorrhages, clubbing of fingers or cutaneous emboli. Eight days after admission the patient died. On post mortem examination, the anterior and posterior cusps of the aortic valve were distorted and fringed by large polypoid vegetations and the anterior cusp was perforated; the right cusp was unaffected. There was only one old infarct in the upper pole of the right kidney but no other evidence of dissemination of emboli. No evidence of gonorrhoea was present, nor was a history of gonorrhoea obtained. A detailed account of the case has been sent to the Caribbean Medical Journal for publication.

E.—Miscellaneous Blood Examinations.

Haemoglobin	...	7
Blood platelet count	...	7
Coagulation time	...	1
Reticulocyte count	...	12
Sedimentation rate...	...	6
Icterus index	...	3
Stippling of red cells	...	4
Formol-gel reaction	...	1
Total	...	41

EXAMINATION OF FAECES.

A.—Microscopic.

Ankylostome ova were present in	...	236 samples
" larvae	...	33 "
Ascaris ova were	...	22 "
Trichuris ova were	...	6 "
Oxyuris	...	2 "
Strongyloides	...	3 "
Flagellates	...	3 "
Ankylostome and ascaris ova present in	...	9 "
" " trichuris	...	1 "
" " strongyloides	...	2 "
" " trichuris and ascaris were present in	...	2 "
Ascaris and trichuris were present in	...	4 "
Strongyloides and trichuris	...	1 "
Trichuris and flagellates	...	1 "
Entamoeba histolytica	...	19 "
" cysts	...	1 "
" histolytica and ankylostome ova	...	2 "
" " " flagellates	...	1 "
Cysts unidentified	...	6 "
Adult ankylostome	...	1 "
Total	...	355
Negative	...	1,031

Total number of specimens received ... 1,386

The absence of *Schistostomum mansoni* from this list is noteworthy, especially in view of the fact that it is a common parasite in the adjoining colony of Surinam.

B.—Faeces Culture.

B. typhosum was isolated from	...	50 samples.
B. dysentery flexner	...	2 "
B. dysentery unidentified	...	1 "
Total	...	53
Negative	...	541

Total samples received ... 594

URINE EXAMINATIONS.

Microscopical examination	...	289 samples.
Chemical	...	118 "
Urea concentration tests	...	75 "
Volhard test	...	3 "
Culture	...	195 "
Total	...	680

As in the case of faeces, *S. haematobium* is conspicuous by its absence in this Colony.

SPUTUM EXAMINATIONS.

Mycobacterium tuberculosis was present in	129 samples.
Moniliform organisms were " "	9 "
Negative	1085 "
Cultural examinations	25 "
Total number of specimens received	1248

CEREBRO-SPINAL FLUID EXAMINATIONS.

Globulin and cell count	...	...	46
Microscopic examination	...	...	4
Culture	...	...	9
Sugar	...	...	1
Wasserman reaction	...	...	50
Total specimens received			110

SKIN SCRAPINGS.

Mycelium and spore unidentified	...	3
Tinea versicolor	...	1
Aspergillus	...	1
Blastomycosis	...	1
Trichophyton	...	2
Microsporon	...	1
Staphylococcus albus (culture)	...	1
Total specimens received		10

THROAT SWABS.

(1) <i>Cultural Examination.</i>	
Klebs Loeffler bacillus was isolated from	21 specimens
Streptococci were " "	10 "
Moniliform organisms were " "	5 "
Negative	141 "
Total specimens received	177
(2) <i>Microscopic Examination.</i>	
Klebs Loeffler bacillus isolated in	4
Negative	6
Total	10

URETHRAL, VAGINAL AND PROSTATIC SMEARS.

Neisseriae gonorrhoeae identified in	...	280
Negative	...	2246
Total specimens received		2526

Many of these specimens were from the treatment centre and this accounts for the large number of negative results.

MEDICO-LEGAL.

Vaginal smears for spermatozoa	...	12
Seminal stains on clothing	...	6
Total specimens received		18

PUS FOR MYCOBACTERIUM LEPRAE.

Positive	...	5
Negative	...	19
Total specimens received		24

PUS FROM VARIOUS SOURCES.

Staphylococcus was isolated from	18 samples.
Pneumococci " "	7 "
Streptococci " "	3 "
B. Coli " "	4 "
Neisseriae gonorrhoeae "	1 "
Negative	26 "
Total specimens received	<hr/> 59 <hr/>

PUS FROM MOUTH.

Streptococci were isolated from	3 samples.
Treponema vicenti and fusiform bacilli from	3 "
Total specimens received	<hr/> 6 <hr/>

MILK EXAMINATIONS.

One hundred and twenty-eight samples of milk were received from the Government Public Health Department for cultural examination.

AUTOPSIES.

One hundred and eighty-one autopsies were performed. Spleen cultures were made from five cases and the *B. typhosum* isolated from two. Thirty-nine smears from liver, lungs and spleen were examined microscopically.

MORBID HISTOLOGY.

One hundred and thirteen portions of tissue were sectioned and examined. Many of these were from autopsies and consisted of portions of kidney. It is hoped to make a systematic examination of all kidneys which at autopsy show pathological changes, but the number obtained up to the present accompanied by clinical data is too small to enable any deductions to be drawn.

MISCELLANEOUS EXAMINATIONS.

Eight scrapings from penile ulcers were examined and the *Treponema pallidum* demonstrated in five. Twelve conjunctival swabs were examined: the gonococcus was demonstrated in one and diphtheroids in another. Most of these cases came from the ophthalmic department of the hospital and were taken as a precautionary measure before operation. Three samples of bile were cultured from one of which bacterium typhosum was isolated and from the other two, bacterium coli. Fifty fractional test meals were examined, one sample of human milk was cultured, and one of a sample of a solution of adrenaline.

P. A. CLEARKIN,
Government Bacteriologist and Pathologist.

APPENDIX I.

(B)

NUTRITIONAL ANAEMIA IN BRITISH GUIANA.

During the months of November and December, 1938, over seventy cases of anaemia were investigated in the Government Laboratory. Of these, fairly complete records of 54 are available for analysis.

Of the 54 cases, 46 were macrocytic, that is to say, presumably of the nutritional type, seven were normocytic, and one microcytic. Of the 46 macrocytic anaemias, two were Addisonian, one was a case of myelogenous leukaemia and one a case of subacute bacterial endocarditis. These can be excluded from the list, leaving 42 cases of anaemias of the nutritional type to be analysed.

These 42 cases will be considered under the headings of:

- (1) Red cell count.
- (2) Haemoglobin content
- (3) Relation to pregnancy.
- (4) Age and sex.
- (5) Race.
- (6) Diet.
- (7) Parasitic infections.

Red Cell Count.

Below one million red cells	...	...	6 cases.
Between one and two million	...	...	15 "
Between two and three million	..	...	8 "
Between three and four million	...	...	11 "
Over four million	...	...	2 "

Of the eleven cases giving a count of between three and four million cells the diet of ten was liberal and mixed. The diet of the remaining case was not determined. Both those with a count of over four million gave a history of a liberal mixed diet. Only one case with a count of below three million gave a history of a liberal diet. His history is interesting. For several years he suffered from a low fever which was diagnosed as chronic malaria but there is no record of blood examination for parasites. Quinine and other anti-malarial remedies had no effect on the fever, nor had various proprietary preparations tried by himself. Leave in England last year failed to effect any great improvement in his health. Five weeks after commencing liver treatment his red cell count had risen to almost four million and his health had much improved.

Haemoglobin.

The haemoglobin content of the red cells was below normal (taking a M.C.H.C. of 32 as normal) in 33 cases. In two cases it was rather high, the M.C.H.C. being 36 in one and 39 in the other. Both of these cases had been treated intensively with iron preparations before having a blood count done, with no effect on the anaemia. The haemoglobin concentration in one case was 33 and in the remainder 32.

Relation to Pregnancy.

Fourteen of the cases occurred in pregnant women. It is perhaps not quite correct to describe these cases as nutritional, but as there is no means of distinguishing between macrocytic anaemias of pregnancy and macrocytic anaemias in pregnancy, it was thought advisable to consider them as nutritional in origin.

Age and Sex.

Thirty-one cases were in females and eleven in males. Patients of all ages from 14 to 60 years have been seen but the total number of cases in the series is not sufficiently large to warrant deductions being drawn as to its prevalence in any particular age group.

Race.

Every race in the Colony is represented in the series. The racial distribution is as follows :—

<i>Race.</i>	<i>Male.</i>	<i>Female.</i>	<i>Total.</i>
East Indian ...	4	11	15
Local Europeans (including Portuguese)	1	4	5
Mixed ...	2	8	10
Europeans (Immigrant)	0	4	4
Black ...	1	4	5
Aboriginal Indians	1	1	2
Chinese ...	0	1	1

Diet.

Eleven of the patients were of good social and financial standing, partaking of regular meals and a good mixed diet. The remainder were of the hospital class. In only two of this class was the diet good and mixed. But in this connection it must be remarked that in only twelve of the hospital cases was an account of the dietary obtained (it was only after carrying out systematic blood counts during the routine work of the laboratory for a month that it became apparent that a form of anaemia was responsible for a substantial amount of ill-health and steps were taken to obtain a history of the usual diet from every patient). In nine of the cases, meat formed a negligible part of the diet or was not taken at all.

This information is not sufficient to enable one to determine whether or not absence of any specific article of food is responsible for the anaemia.

Parasitic Infestation.

(a) *Malaria*.—As a primary cause of the anaemia malaria can be excluded from practically all, if not all, the patients belonging to the higher social strata living in Georgetown. Although it is difficult to exclude it from others, nevertheless, it is remarkable that parasites were seldom found in the hospital class, and parasites were never seen in the blood films of those cases when doing the differential count. In a country where malaria is endemic it is difficult to assess the part malaria plays and there is a tendency to ascribe any anaemia in the inhabitants to the effects of malaria. In the case of Georgetown, part of the centre is remarkably free from malaria, or at any rate from the clinical manifestations of malaria, and a number of the patients residing in these areas gave a history of never having had malaria. In such cases it must be conceded that malaria cannot have had any part in determining the anaemic condition.

Ankylostomiasis.

Though manifestation with ankylostome is not uncommon such infection is rarely heavy and can be excluded from twenty of the cases. Ova were found in nine cases, only one, an Aboriginal Indian, being heavily infected, and there are no records regarding the remaining thirteen cases. Helminthic infestation can therefore not be accepted as a primary cause of the anaemia, though doubtless it is a secondary factor in some cases.

Filariasis.

Though some of the patients suffer from filariasis the great majority showed no evidence of infestation with this parasite. It can have little, if any, effect in giving rise to the anaemia.

Comments.

The number of cases here described is of course too small to enable any deductions of value to be drawn, but it is sufficient to indicate that a dyshaemopoietic anaemia exists in the Colony, that it is not confined to any age, race, or sex, that it is more prevalent in the female sex though not confined to that sex, that it is not directly related to malaria, filaria, or ankylostomiasis, and that it apparently is not related to a quantitative food deficiency.

The actual number of cases here recorded is no criterion of the prevalence of the condition. The laboratory can only deal with a very limited number of cases and a thoroughly satisfactory investigation is quite beyond the resources of the present establishment.

The investigation is being continued and further data are being collected so that, if the work goes according to plan, sufficient information will have been collected by the end of the current year to permit a more complete analysis.

P. A. CLEARKIN,
Government Bacteriologist and Pathologist.

APPENDIX II.

MALARIA IN BRITISH GUIANA.

PART I.—THE ANOPHELINE MOSQUITOES OF THE COLONY.

BY

G. GIGLIOLI, M.D. (IT.), M.R.C.P., (LOND.); D.T.M. & H. (ENG.).

Medical Adviser to the Sugar Estates of British Guiana.

The malaria problem, in all its phases, is intimately related to agriculture: malaria is eminently a rural disease and rural and agricultural populations suffer most from its ravages.

Malaria is closely connected with the distribution of surface waters and land configuration; agriculture, by altering surface water conditions and land configuration, through drainage and irrigation, directly affects, beneficially or adversely, the incidence of malaria. Extensive agriculture often favours malaria; intensive agriculture, on the contrary, radically eliminates it. It is by the forcible establishment of intensive agriculture in localities recently reclaimed by drainage, where malaria had reigned supreme for ages, that such brilliant results have been reaped, in less than a decade, in the Pontine marshes and other classical malaria regions of central and southern Italy.

Agriculture, in this Colony, is eminently extensive in its type; sugar and rice; both these forms of cultivation are dependent on adequate irrigation; sea water is injurious and must be excluded, hence sea defences and elaborate systems of sluices and pumping stations; rain and flood waters are stored in conservancies situated aback of the cultivation, to feed thousands of miles of irrigation canals which riddle the coastlands. Thus ideally favourable breeding sites are provided for mosquitoes, at all seasons, and breeding continues the year around with greater or lesser intensity, according to the temperature and the individual characteristics of each species.

In this Colony, perhaps more than elsewhere, the connection between agriculture and malaria is intimate: there can be no doubt that the prevailing forms of cultivation, rice and sugar cane, influence the malaria problem adversely.

Malaria is a *mosquito borne* disease; not all mosquitoes are capable of transmitting it; this pernicious role is exclusively restricted to mosquitoes of the genus *Anopheles*. These facts can now be regarded very nearly as common knowledge; but it is not, as yet, at all appreciated that the carrier problem must be restricted to yet a much more limited field: *only a relatively small number of species, in fact, out of the many included in the genus Anopheles have practical importance in the transmission of malaria.*

Some species of *Anopheles* are not susceptible to infection, even when repeatedly fed on patients harbouring abundant malaria parasites in their blood, in the phase suitable for mosquito infection. In others, infection occurs, but the parasite appears unable to undergo its full development and fails to reach the stage in which it again becomes infectious to man when inoculated in the blood stream through the mosquito's bite. Such species of *Anopheles*, evidently, are constitutionally unfit for the transmission of malaria and their practical importance to the malarialogist is nil.

There are other species of *Anopheles* which in the laboratory can be infected with malaria with the greatest ease, but under natural conditions very rarely become infected as they bite *animals selectively* and man only as the exception. It is very unlikely that an individual mosquito, belonging to one of these "zoophylous species," should bite man repeatedly at the interval required for it to become infective. *Transmission of malaria by such species is evidently possible, but sufficiently unusual to lose much, if not all, practical importance.*

With some species *zoophylia* is a constant characteristic; in others it may be acquired under favourable conditions; thus a same species of *Anopheles* may be found to be dangerous carrier in one region, whilst it is zoophylous, and therefore harmless, in others. Such is the case with the species *Anopheles maculipennis*, the main vector of malaria in Europe; with the advent of intensive agriculture, which implies an abundance of livestock and animal shelters, this species tends to restrict its biting activities to the shelter of stables, cowsheds and pigsties; "biological varieties" evolve which do not attack man, and thus lose all importance as natural vectors of malaria.

In England, in the districts where malaria, in a not too distant past, used to be endemic, *A. maculipennis* still abounds, not in homes but in animal shelters. We have seen it in enormous numbers in Survey pigsties and cow barns. Likewise in Italy zoophylous biological varieties of this species exist at present in localities which were malarious only a few decades ago.

PLATE I.



FIG. 1.—*Anopheles albitarsis*: Adult female. The two longitudinal parallel lines of large white scales which adorn the ventral aspect of the first abdominal segment (sternite) are distinctive of this species.

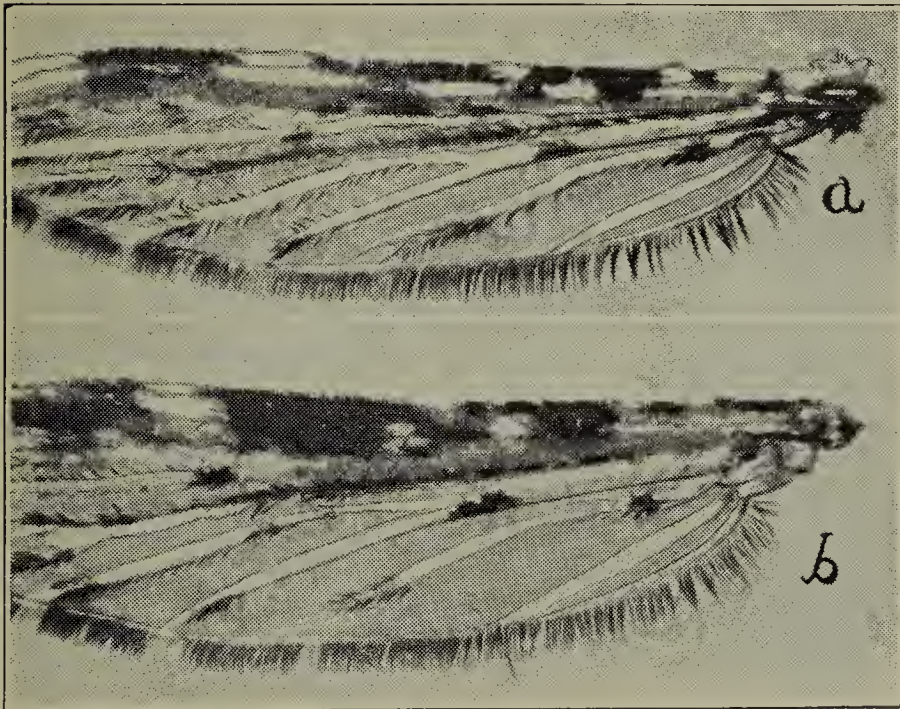


FIG. 2.—Wing markings of:
(a) *A. albitarsis*.
(b) *A. darlingi*

PLATE II.

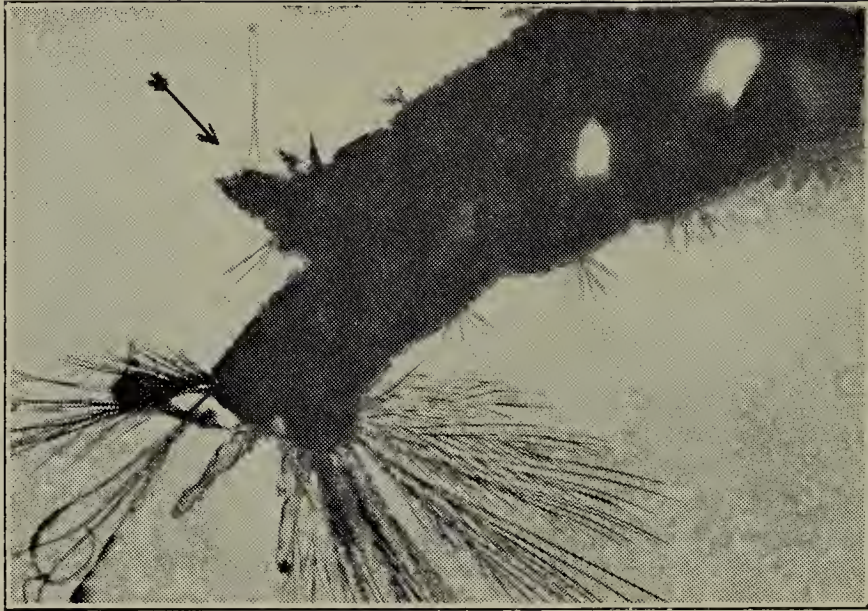


FIG. 3.—Caudal portion of the larva of *A. darlingi* showing the two characteristic bristles which surmount the dorsal plate of the spiracular or respiratory mechanism. This feature is peculiar to this species.

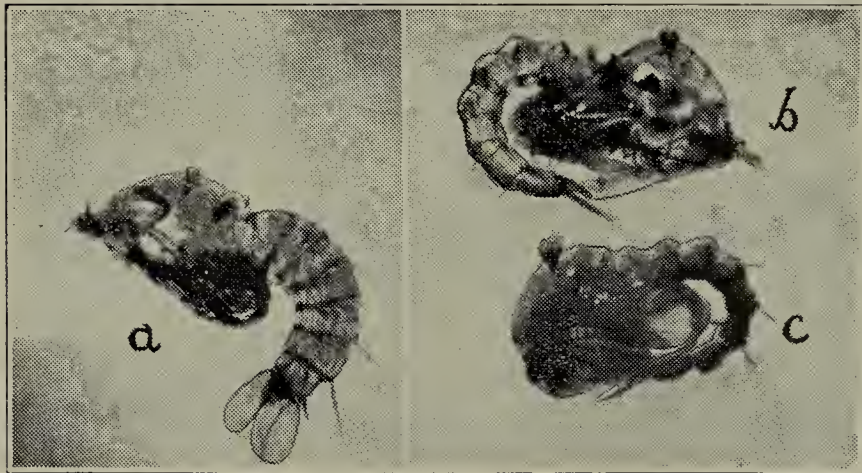


FIG. 4.—Pupae of:
(a) *A. albitarsis* (note scoop-shaped breathing trumpets).
(b & c) *A. darlingi* (the margins of the breathing trumpets are deeply indented).

In the American tropics, some 30 or 40 species of *Anopheles* have been listed by various authorities. These species vary widely in their geographical distribution, their feeding and breeding habits and in their infectability to malaria.

We have outlined these facts as they constitute the basal principles on which rational malariology is founded.

In any given malarial locality the following are the first and basal problems to be resolved :

- (1) The identification of the local existing species of *Anopheles*.
- (2) The distribution and incidence of such species in relation to the distribution and incidence of malaria.
- (3) The detailed biology of each species with special regard to breeding, biting, and flying habits.

Once these data are fully acquired we have at our disposal the means for intelligent, direct and, above all, economical malaria prevention : our whole effort can be concentrated on the *control of the species which is or are the proven vectors of malaria in the region* ; the others may be ignored in all safety.

The conditions we have found in this Colony are a very striking example of this definite limitation of the malaria problem to a single *Anopheline* species. The practical importance of this fact is too obvious to be stressed : it means that for the control of malaria in British Guiana we must deal with a *single species*, subject to certain definite limitations in its breeding habits ; we can, on the other hand, ignore other species of *Anopheles*, much less exacting, as we shall see, in their breeding requirements. In consequence of their greater adaptability these latter species are very much more widely distributed and abundant so that given the physical configuration and climate of the colony, their control would be practically impossible.

The whole classification of tropical American *Anophelines* is, at present, under revision as methods have been perfected greatly of late years ; the anatomical characters of the males have acquired great taxonomic importance.

It is by no means possible, at present, to give a complete catalogue of the local species of *Anophelines* ; we can only mention those which we have encountered in our personal experience of some 15 years. From 1934 to the time of writing we have examined and identified over 20,000 specimens collected from numerous coastal localities between the Essequibo and Corentyne estuaries and from the interior, on the Demerara, Essequibo and Potaro rivers. We are indebted to Mr. and Mrs. H. E. Turner for a collection of 70 *Anopheles* captured in various localities on the Rupununi Savannas in August, 1936.

Three species of *Anopheles* are widely distributed and very abundant in the Colony. They all belong to the sub-genus *Nyssorhyncus* the members of which can easily be recognized by the silvery white extremities of their hind legs. We will not go into detailed descriptions, limiting our exposition strictly to the main differential characters which are of practical importance in the field and in the laboratory for routine identification purposes. The more important of these characters are very plainly visible in our series of micro-photographs.

A. tarsimaculatus. This species can easily be identified with the help of a simple magnifying glass, as it possesses a black spot or ring at the base of the last segment of the hind legs. It is ubiquitous : we have specimens captured in houses in Georgetown, from West and East Demerara, from Western Berbice and the Corentyne coast, where we have found it particularly abundant. It is occasionally found along the rivers in the interior, wherever some clearing of the forest has been effected. This species is also represented in our collection from the Rupununi.

We have also observed the occurrence of a known variety of *A. tarsimaculatus* characterized by having a larger portion of the hind legs white ; (the black portion of the 2nd tarsal segment is represented by only a narrow ring at its base). We have specimens of this variety from the Berbice Estuary and from the Rupununi Savannas.

The existence of *A. tarsimaculatus* in the Colony has long been known. Bodkin and Cleare observed that it abounded in localities which were only mildly malarial. It has been regarded as the principal carrier of the disease on the coast. Flu and more recently Bonne and Bonne Wepster expressed the same opinion as regards the coastland of Surinam.

In our own experience, though the larvæ of this species are by far the most commonly and easily found, *A. tarsimaculatus* is relatively rarely caught in the dimly lighted native houses ; but it is not at all uncommon to capture it in bright, electrically lighted estate hospitals or staff houses. It is evidently attracted there by the light as myriads of other winged insects. *A. tarsimaculatus* becomes active at dusk ; but occasionally and in proximity of its breeding sites, it may attack in large numbers and in full sunlight when disturbed from its resting places in high grass or bushes. It can be found at all seasons, throughout the year, but is much more abundant during the warmer months from May to October.

A. tarsimaculatus abounds in stables, cattle and sheep pens, and can easily be caught on

horses and cattle in the open, after sunset. With Mr. Komp, of the United States Public Health Service, in July, 1936, we observed this species in countless thousands in cattle sheds at Gibraltar, on the Corentyne coast, some 10 miles east of New Amsterdam. This locality is practically free from malaria. The sheds were open to the strong sea breeze and the *Anopheles* were crowded over the timber sills forming the base of the building, some 6 inches off the ground; many were actually resting on the rough, damp clay floor evidently resisting the strong breeze with considerable difficulty. Males were also present in large numbers, this fact indicating the close proximity of their breeding sites in the extensive frontland brackish marshes. *A. tarsimaculatus* haunts savannah countries open to sun and wind; it is a hardy species and its resistance to the desiccating action of the wind is very considerable.

This species shows remarkable adaptability and latitude in the choice of its breeding sites: irrigation canals, drainage trenches, flood fallowing cane fields, rice fields, flooded pastures and savannahs, swamps, marshes, ponds, rain water collection of all kinds, puddles, cow holes, ruts, clean water and dirty water, salt, brackish and rain water, strongly acid, neutral and alkaline water, all suit it and in all it flourishes. Brackish waters are probably its favourite breeding sites, hence its abundance in the extensive salt marshes of the Corentyne coast frontlands. The pH of waters in which *A. tarsimaculatus* was found breeding ranged from 4 to 7.8; the sodium chloride contents from g. 0.005 to g. 28.000 per litre.

The two following species, *A. albitarsis* and *A. darlingi*, though extremely common, have not previously been identified in this Colony, being in the past regarded as a single kind under the erroneous designation of *A. argyritarsis*. This confusion is easily explained by the close similarity among the adults of the *Nyssorhyncus* group; on the other hand, the differential characters which are revealed by closer examination are so evident and distinctive that it is surprising they should have eluded detection for so long.

A. argyritarsis is a valid species first described in Panama; its importance as a malarial vector was there regarded as of small moment. It occurs in Brazil, but, up to recently, even in that country, it was currently and widely confused with the following two species.

Exact information on its geographical distribution is still lacking: so far we have failed to find it in this Colony. This evidently, does not exclude definitely its presence, but we feel authorized to state that even if it does occur in small numbers, or in restricted foci, the importance of this species, in relation to the malarial problem in British Guiana is nil.

A. albitarsis: the adult insects of both sexes can be easily recognized by the presence of two parallel rows of conspicuous white scales on the ventral surface of the 1st abdominal segment (1st sternite). In dried specimens, through retraction, the sternite is usually concave so that these lines of scale acquire a V-like or converging disposition. Fig. I shows the latero-ventral aspect of a female *A. albitarsis*; one of the rows of scales we have described is clearly visible.

Fig. II demonstrates the differences in the wing markings of *A. albitarsis* and *A. darlingi*: the different disposition of white and black markings of the costa, or anterior wing rib, at its base, should be noted: in the former (a) two small black spots stand out in contrast on the white background; in the latter (b) the colour scheme is reversed and two small light coloured spots stand out on a black background. The light coloured wing scales of *A. albitarsis* are white; those of *A. darlingi* are golden yellow.

The larvae of *A. tarsimaculatus* and *A. albitarsis* though very similar, can be differentiated in the laboratory on the characters of some of their ornamental hairs, but for this purpose a certain amount of experience is necessary. The pupæ of these species vary considerably in colour, from dark to light brown, yellowish or bright green; we know of no good character for their differentiation.

The distribution of *A. albitarsis* in the Colony is wide: we have collected it in West and East Demerara, in Western Berbice and on the Corentyne coast; we have never observed it in the forest areas of the interior and we doubt its existence in such districts. Ninety per cent. of our specimens from the Rupununi belong to this species.

A. albitarsis presents a well marked seasonal incidence: it appears early in May and continues throughout the warmer weather to October or November, fluctuations occurring from year to year according to variations in the seasonal distribution of the rainfall. It is very unusual to find this species between December and April.

The favourite haunts of *A. albitarsis* are open savannahs and pastures where cattle abound. It occurs in great numbers on the backdams of Western Berbice estates and on the Abary savannahs. It naturally flies and feeds after dusk, but if disturbed from its shelter in the grass or bushes it will attack viciously and in full sunlight. Riding on the Abary savannah and, we understand, in the Rupununi, is often made very unpleasant by the attentions of this mosquito. It is little affected by high breezes and, on the whole, we have found it a much harder species than the following one.

In the selection of its breeding sites it appears to favour large bodies of water well.

PLATE III.

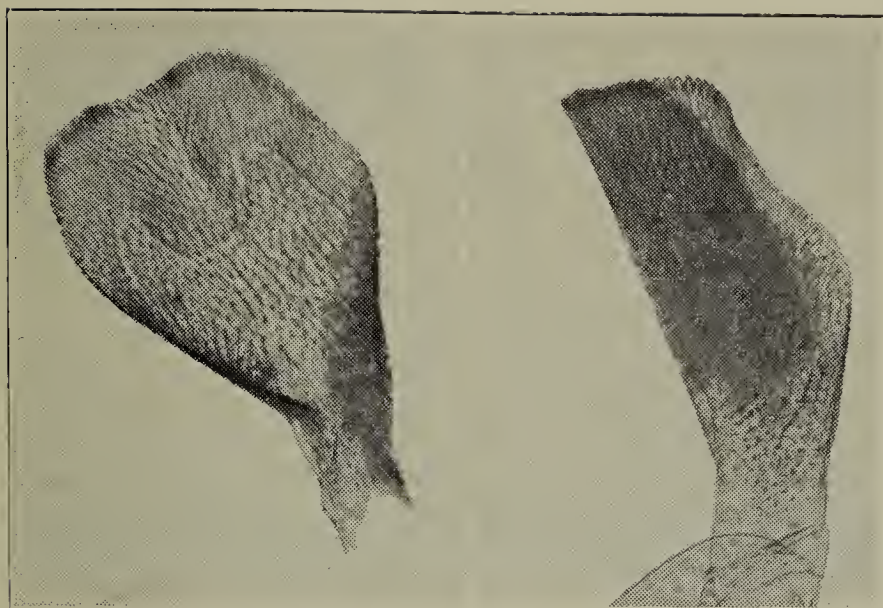


FIG. 5.—Breathing trumpets of *A. albitarsis*.

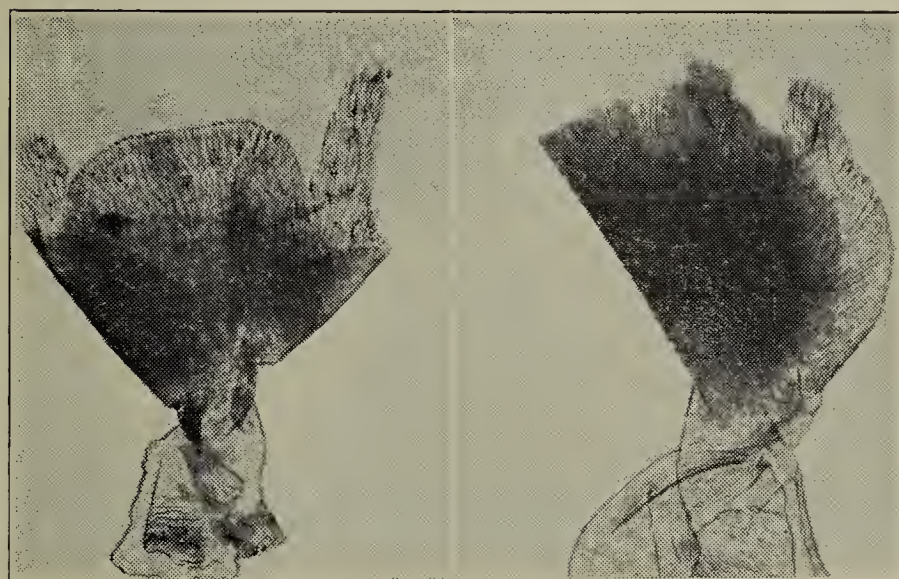


FIG. 6.—Breathing trumpets of *A. darlingi*.

exposed to the sun: flooded savannahs and pastures; flood fallowing canefields, ricefields, irrigation canals, etc. It also occurs occasionally in ponds, small drains and temporary rain water collections.

The waters in which it breeds are clean, slightly acid or neutral in reaction, with a low content in soluble salts (pH range 6.6 to 6.9; sodium chloride 18 to 30 milligr. per litre).

A. darlingi: the adult insects of both sexes in this species present the following differential characters: the distal half of the 2nd and all of the 3rd, 4th and 5th tarsal segments of the hind legs are snow white; the wing markings are distinctive, and there are no white scales on the 1st abdominal sternite. These characters have already been described when dealing with *A. albitarsis* and are well illustrated in Figs. I and II.

The larva of *A. darlingi* presents a very striking and unique character in the form of two long, straight bristles, surmounting papillæ placed on the dorsal plate of the spiracular or breathing mechanism. These bristles are directed dorsally so that when the larva lies horizontally just below the water surface, they protrude through the surface film; they are very clearly shown in Fig. III and can be detected already in the 2nd and 3rd stage of larval development.

The pupa of *A. darlingi* is equally well characterized; its colour is always dark brown; the breathing trumpets which in *A. tarsimaculatus* and *A. albitarsis* are delicately chitinized with a plain scoop-like shape, in *A. darlingi* have a very much more elaborate structure: the trumpets are heavily chitinized, more open and present, on their lateral margins deep indentations which give rise to two very characteristic finger-like projections. Our micro-photographs illustrate these characters more effectively than any description (Figs IV, V, and VI).

A. darlingi was first described by Root at Bahia, Brazil, in 1926; the investigations of Shannon, Davis, Kumm, Bennaroch and others have demonstrated its wide distribution in equatorial South America. It ranges from the foot hills of the Andes throughout the Amazon valley to the Atlantic seaboard; it occurs in Venezuela and we have established its presence in British Guiana: its southern range is not, as yet, fully determined.

In the Colony it is *the* Anopheles of the forest areas of the interior on the tidal and flood rivers; we have collected it in large numbers on the mid and upper Demerara, on the Essequibo and Potaro Rivers. On the coast it is often associated with *A. tarsimaculatus* and *A. albitarsis* but its general distribution does not follow these two species. In some coastal localities it is extremely abundant, particularly on the estuaries of the Demerara and Berbice rivers and on the West and East Coast of Demerara. So far we have had difficulty in finding it at Cane Grove and it is definitely rare along the sea coast of Western Berbice. It represented only 8.3% on 697 Anopheles captured in houses on Bath Estate between 1934 and 1937. This species occurs also in our Rupununi collection: a single specimen was captured on human bait in a partly forested district at the foot of the Kanuku Mountains.

The three species we have described, *A. tarsimaculatus*, *A. albitarsis*, and *A. darlingi*, between them, account for 99.9% of the 20,000 adult *Anopheles* we have collected and identified. All the larvae and pupae we have examined, without exception, belong to these three species.

Other Anophelines evidently occur in the colony but always in small numbers and it is quite exceptional to capture them in houses. We have some female specimens of two different species belonging to the *Arribalzagia* group; they were all caught in wooded localities, on the mid-Demerara, on the Berbice Estuary and in the Rupununi District, most of them on animal bait in the open; larvae and males have not, as yet, been found and for this reason their exact identification is still doubtful.

A. (Stethomyia) nimbus has been reported from the Colony and Komp found it common in the forest at Kartabo in July, 1936.

It is quite evident that these and eventually other rare, or at least uncommon, species, can have no practical importance from malariological stand-point. Malaria in British Guiana is extremely prevalent widely distributed; its carrier or carriers must therefore, evidently, be equally common.

We have seen that *A. tarsimaculatus*, *A. albitarsis*, and *A. darlingi* are all extremely numerous with a wide range of distribution, all of them, therefore in this respect could adequately fill the role of malaria carriers.

The relative importance of each one of these species in regard to the transmission of malaria, under local conditions, will next be treated.

PART II.—WHICH OF THE LOCAL ANOPHELINE SPECIES ARE RESPONSIBLE FOR THE TRANSMISSION OF MALARIA?

We have seen that three species of *Anopheles*, *A. tarsimaculatus*, *A. Albitarsis* and *A. darlingi*, exist in this Colony in large numbers and with a wide distribution.

All of these are known as malarial vectors in other regions of Tropical America: *A. tarsimaculatus* is a carrier in Panama and Trinidad: Kumm (1932) at Bahia, in Brazil, found *A. albitarsis* abundant in houses and 5.8% were infected with malaria; *A. darlingi* is now recognised as the principal and most dangerous carrier in Brazil, from the Atlantic to the Andes, throughout the Amazon basin and in Venezuela; more recently, it has been found in French Guiana.

All these three species are susceptible to infection when made to feed on suitable malaria patients. We have ourselves had no difficulty in producing such artificial infections. These experiments are by no means conclusive as incriminating evidence, as the conditions which are created in the laboratory do not necessarily subsist in nature.

In the present section we propose to lead what evidence we have been able to collect concerning the relative importance of each one of these mosquitoes in relation to the transmission of malaria in this Colony.

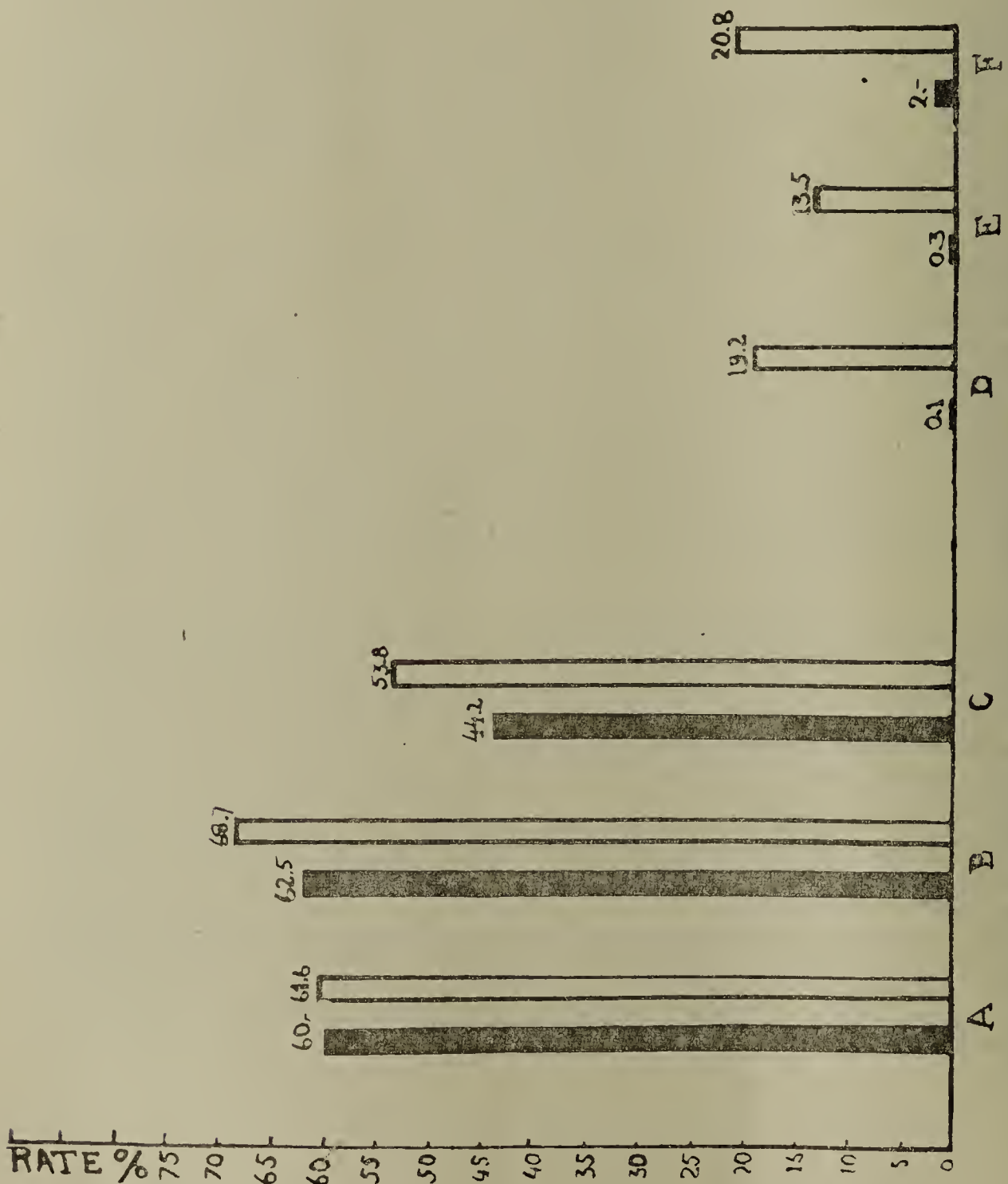


FIG. 1:—The black columns indicate the Spleen and the white ones the Parasite Rates—By the comparison of these two values it is possible to "date" the existence of malaria in any one locality.

A, B and C refer to localities of the West and East Coasts of Demerara: the two rates are high and more or less similar; these localities are subject to endemic or habitual malaria. D, E and F refer to localities of the Corentyne Coast: while the spleen rates are nearly negligible, the parasite rates are considerable; this indicates recently introduced or epidemic malaria.

(1) GEOGRAPHICAL AND TOPOGRAPHICAL DISTRIBUTION OF MALARIA IN THE COLONY, AND ITS RELATION TO THE DISTRIBUTION OF THE VARIOUS ANOPHELINE SPECIES.

There is no part of the Colony, on the coast or in the interior, which can be said to be entirely free from malaria. Concerning the incidence and the distribution of this disease it is necessary to bear constantly in mind that malaria infection can remain latent for weeks and months. The infection may not become apparent till long after the patient has left the locality where he contracted it. We have known cases which suffered their first attack in Europe several months after leaving the Colony.

The occurrence of a few cases of malaria in any one given place, therefore, by no means implies that the disease was acquired on the spot and that the locality must be regarded as malarial.

In this connection the frequent displacement of the population from one district to the other, in search of work, must be considered. The gold, diamond, bauxite and timber industries keep a constant flow of men between the coast and the highly malarial districts of the interior. Cane cutting and rice planting and reaping again cause frequent seasonal displacements of the population along the coast and on the smaller rivers (Mahaica, Mahaicony, Abary and Canje).

Apart from these well defined, regular and, more or less, constant or seasonal currents one must not forget the ordinary displacement due to business or pleasure as, for instance, the prevailing custom, amongst East Indian women and children in particular, of "passing time" with relations or friends on other estates or in villages.

We will now outline briefly the methods currently employed for measuring the incidence of malaria.

The *Parasite index* of a locality or community is given by the percentage of children under 12 years, habitually residing in that locality, which actually harbour malaria parasites in their blood. This is a direct method of measurement giving exact data on the actual rate of infection at the time of the survey. Recent and acute infections naturally are the most easily detected.

The *Spleen index* shows the percentage of children which present enlargement of the spleen. This is a very frequent symptom of long standing and repeated malaria infection; other diseases may cause the spleen to enlarge, but in this Colony such conditions are so few and rare that their influence may be overlooked. The splenic index, being affected mainly by chronic and repeated infections, supplies information more particularly as to the *habitual incidence of malaria* in the locality.

It will be noted, therefore, that the Parasite and Spleen indices give somewhat different information; by their comparison we are enabled to *date* the local malarial outbreak and to decide whether we are in the presence of recent, epidemic or acute malaria or of old standing, habitual, endemic, or hyperendemic malaria.

If malaria has only occurred recently, in epidemic form, many children will be found with parasites in their blood, but their spleen, in most cases, will be only slightly if at all affected. The parasite index, therefore, is relatively high whilst the spleen index, is low. Conversely if malaria has prevailed in the district for long years parasites and enlarged spleens will both be prevalent, and the spleen and parasite indices will more or less coincide. These points are well shown in diagram No. 1.

In the comparative study of spleen rates, in this Colony it is very important to give full consideration to the racial factor. Negroes though equally susceptible to malaria as other races, tolerate the infection better, and react less frequently and less conspicuously with splenic enlargement. In communities where Negroes abound the spleen index alone may give misleading results; it should always be supplemented by the parasite index. Diagram No. 2 clearly illustrates this point.

Between 1933 and 1937 we carried out repeated malarial surveys at Blairmont and Providence on the Berbice River estuary, and at Bath on the West coast of Berbice. In 1937-38 we extended this survey to fifteen other estates from De Kinderen, on the West Coast of Demerara, to Skeldon on the Corentyne estuary. During the latter survey, 5,814 children were examined for enlargement of the spleen and from 2,389 blood slides were taken for the demonstration of malaria parasites. Haemoglobin percentage estimations were also taken from each child, in order to determine the incidence and degree of anaemia.

These surveys have shown malaria to be endemic or even hyperendemic along the West and East Coasts of Demerara, and on the Demerara and Berbice river estuaries, with a tendency to become less prevalent on the coast as we proceed towards the east.

At Bath, on the West Coast of Berbice locally acquired malaria is definitely uncommon. In our last survey in 1937, the spleen rate was only 1.3% and the parasite rate 3.5%. On the Corentyne Coast malaria, under normal climatic conditions, is even less common.

The last two years (1937 and 1938) have been definitely abnormal as regards malaria incidence. Between August and November, the disease prevailed in localities which are usually

only mildly malarial; malaria also became relatively common on the Corentyne Coast where as a rule, it is absent.

Our survey, during this period, yielded some interesting figures:

At Albion, with a spleen rate of only 0.1% we found that 19.2% of children harboured malaria parasite (1937).

At Port Mourant the spleen rate was 0.3% and the parasite rate 13.5%.

At Skeldon 2% and 20.8% respectively.

These remarkable discrepancies between the spleen and parasite rates, as has already been stated, indicate that malaria is not endemic on the Corentyne Coast. Its relatively high incidence, in 1937 must be regarded as a purely epidemic and, therefore, transitory occurrence. We will return to this subject later when dealing with the seasonal incidence and local epidemiology of the disease.

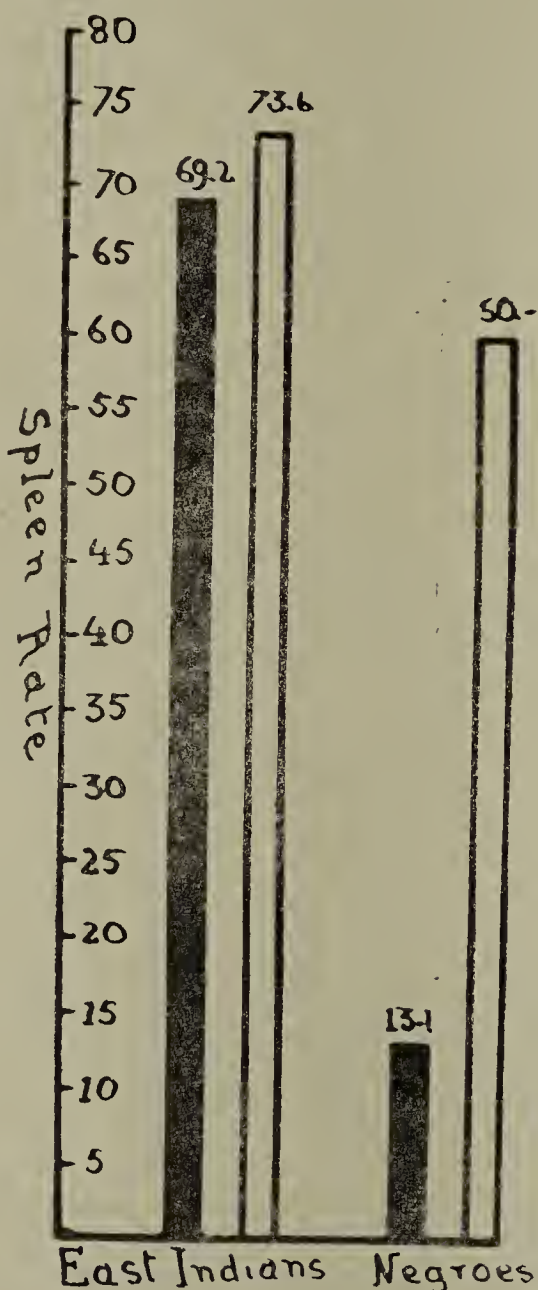


FIG. 2:—In the presence of chronic or repeated malaria infection the splenic reaction of the negro child is very much less marked than in the East Indian. This diagram illustrates conditions on an estate on the West Bank, Demerara; one notes that while there is clear similarity between the parasite rates of the two races, the negro spleen rate is less than $\frac{1}{2}$ of that of the East Indians.

In negro communities, therefore, the spleen rate is of relatively little value; it should always be supplemented by the parasite rate.

In the settled areas of the interior, on the Demerara, Berbice, lower Essequibo, Pomeroon and other tidal rivers, malaria is endemic and, in many localities, hyperendemic. Its occurrence in the upper reaches of these rivers is notorious; such localities as the Potaro district and Kurupukari, on the upper Essequibo, have particularly bad reputations. The Rupununi savannahs, formerly regarded as healthy, are reported to have suffered severely of late years.

This brief review confirms our previous statement that in the Colony malaria is ubiquitous, but its incidence varies within wide limits. Roughly we may say that this disease is

hyperendemic or endemic throughout the permanently or temporarily settled areas of the interior; on the estuaries of the great rivers and on the West and East Coasts of Demerara.

On the front lands of the coast of Western Berbice it is very much less common; on the Corentyne Coast proper there is no endemic malaria, but epidemic outbreaks recur at intervals. On the wide estuary of the Corentyne malaria of late years, has been very mild, but during the last twelve months a severe exacerbation has been noted.

What correlation exists, if any, between this peculiar distribution of Malaria and that of the three prevailing Anopheline Species?

A. tarsimaculatus is only occasionally found in the forest areas of the interior, in localities from which the bush has been cleared. This low incidence is evidently and grossly disproportionate to the very high incidence of malaria in these districts. On the coast this species is abundant everywhere; we have found it particularly prevalent in mildly or non-malarial localities on the Western Berbice and Corentyne coasts.

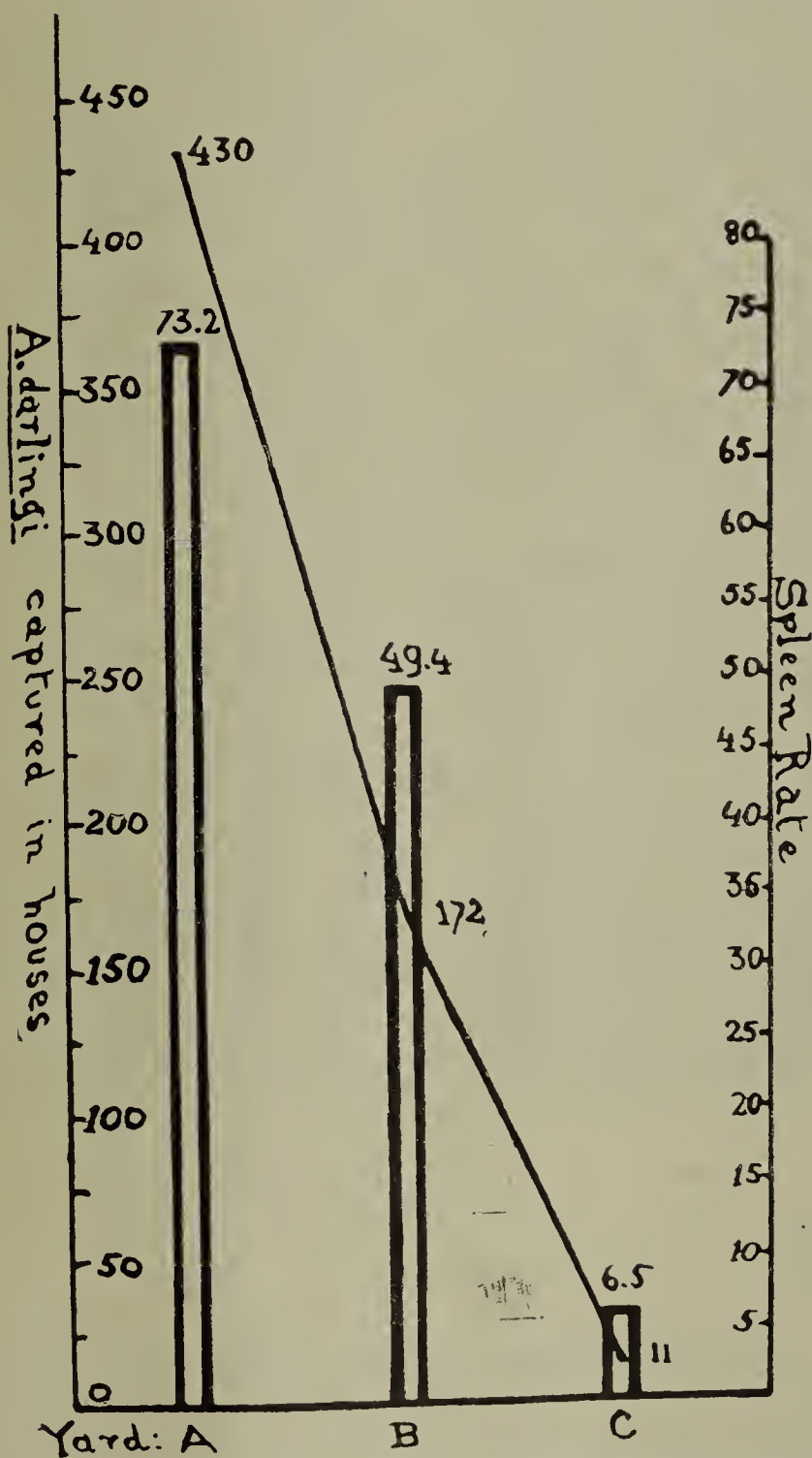


FIG. 3:—The correlation of the distribution of malaria and that of *A. darlingi* is not only geographical, but also topographical. This diagram refers to three separate villages belonging to the same East Coast estate, all situated within a radius of approximately 1 mile. The vertical columns indicate the spleen rate, and the curve, the number of *Anopheles* captured by searching the houses for 2 hours in each locality. Of 613 *Anopheles* thus caught 611 were *A. darlingi*.

A. albitarsis is eminently a savannah mosquito. We have not found it along the highly malarial tidal and flood rivers of the interior. It abounds throughout the East and West Coasts of Demerara, in pastures and rice fields; it occurs in exceptionally large numbers on the backdams of Western Berbice estates and on the Abary savannahs. It is very common at Bath where malaria is only very mildly endemic. So far we have few data concerning this species on the Corentyne Coast but we had no difficulty in finding it at Skeldon, where it is very prevalent in the cane cultivation aback. We have also found it in cow and sheep-sheds at Industry on the Corentyne front lands, some 12 miles East of New Amsterdam.

In our collection from the savannahs of the Rupununi this species accounts for $\frac{9}{10}$ of the specimens. The periodic occurrence of mosquitoes in myriads during and after the rains has always been a well known feature of these savannahs. Myers established that these mosquitoes were all *Anopheles*; but he failed to determine their specific identity. From these and our own findings we would conclude that during the wet season *A. albitarsis* is exceptionally abundant on the Rupununi, and that it was equally abundant a few years back, when the savannahs were regarded as free from indigenous malaria.

We are, therefore, led to conclude that the geographical distribution of *A. tarsimaculatus* and *A. albitarsis* in the Colony does not coincide with that of malaria. Both these species are rare or absent where malaria is at its worst and conversely they abound habitually where endemic malaria is low or even absent.

The geographical distribution of A. darlingi on the contrary coincides rigorously with the local distribution of malaria, moreover the incidence of malaria is directly proportionate to the incidence of this mosquito.

Where *A. darlingi* abounds malaria is hyperendemic; where it is found habitually but in smaller numbers or only at certain seasons, malaria is endemic and seasonal; where it occurs occasionally endemic malaria is absent but occasional epidemics follow in its train.

Of the three species of *Anopheles* we are investigating *A. darlingi* is the only one which is prevalent and wide-spread in the forest areas of the interior. It is very prevalent on the heavily infected river estuaries, and on the West and East Coasts of Demerara; it is, at present, very abundant on the West Bank of the Corentyne estuary where an epidemic of malaria appeared in August last year, and still persists.

This *Anopheles* is represented in our Rupununi collection. At Bath, in Western Berbice, where malaria is very mild, this species occurs but is rare. Of 669 *Anopheles* captured on this estate in 2 years, only 56 belong to this species. ⁽¹⁾

On the Corentyne coast *A. darlingi* is usually absent, but we found it present in small numbers at Port Mourant in October, 1937, when a small epidemic outbreak was active. An epidemic is at present active at Albion; we visited this estate on the 5th of September, and found *A. darlingi* abundant in the houses.

Even on individual sugar estates, studying the incidence of *A. darlingi* in different yards and houses, in parallel with the malarial parasites and spleen rates, one is inevitably led to conclude that not only the geographical, but also the topographical distribution of this particular Anopheline species and that of malaria strictly coincide.

One of the estates, on the East Coast of Demerara, has its population distributed in 3 yards. In these the incidence of malaria varies within wide limits. On the 11th and 12th of August of this year, we carried out mosquito captures in the houses of these different yards, roughly the same time being devoted to each one.

In the following Table we correlate the number of *A. darlingi* captured to the spleen rate amongst the children in each yard:

TABLE I.

Yard :			Spleen Rate :	<i>A. darlingi</i> Captured :
Yard A	...	...	73.2	430
Yard B	...	...	49.4	172
Yard C	...	...	6.5	11

(1) In August this year, since the present section was written, an epidemic outbreak of Malaria of some severity has occurred at Bath. The spleen rates has risen from 1.5% in 1937 to 20% and the parasite rate from 3.5% to 69%.

A. darlingi has appeared in very large numbers and on the 19th of September, in one hour we captured no less than 460 specimens in the houses; 140 were caught in a single room of a range situated in close proximity of the cultivation.

Not a single *A. tarsimaculatus* or *A. albitarsis* was found in the houses, in spite of the fact that the larvae of both these species were enormously abundant in all the surrounding irrigation canals, outnumbering those of *A. darlingi* many times over.

The causes of these unusual malarial outbreaks will be dealt with later under the heading Epidemiology.



FIG. 4:—Random sample of *A. darlingi* captured in houses in the village of Rampoor (Blairmont) which is situated in land on the edge of the Abary Savannah. With very few exceptions all are gorged with blood.
A. darlingi enters houses in large numbers and feeds on man selectively.

PLATE II.



FIG. 5:—Random sample of *A. albitarsis* caught in houses in the same village. With very few exceptions none appear to have fed recently. *A. albitarsis* enters houses accidentally and feeds selectively on animals, cattle, horses and sheep in particular, both in shelters and in the open.

II.—DOMESTICITY OF THE LOCAL ANOPHELINES.

The term "domestic" does not apply *sensu stricto*, to any of the local species of Anopheles, as none of these is in the habit of breeding in water collections or containers, pertaining to houses or their immediate surroundings (rain water tanks, vats and barrels, sagging gutters, discarded tins, etc.) In systematic inspections carried out during the last 15 years, we have *never* found anopheline larvae in such waters.

By "domesticity" we here mean to signify simply the *tendency of these mosquitoes to enter houses*. This is a point of very great practical importance, as it is an established fact that malaria is rarely contracted in the open.

In the following Table we give the relative incidence of *A. darlingi*, *A. tarsimaculatus* and *A. albitarsis* in a series of 15,035 Anopheles captured in houses on the Guiana Coast during the last 4 years.

TABLE II.

Locality.	Anopheles Captured.	RELATIVE INCIDENCE PER 100.		
		<i>A. darlingi</i> .	<i>A. tarsimaculatus</i>	<i>A. albitarsis</i>
Taschen	503	99.8	0.2	0.—
De Kinderen	638	99.4	0.5	0.1
Uitvlugt... ..	452	99.4	0.6	0.—
Wales	815	100.—	0.—	0.—
Ogle	120	99.2	0.—	0.8
Vryheid's Lust	366	98.6	0.3	1.1
La Bonue Intention ..	788	99.8	0.—	0.2
Blairmont	8,718	84.—	3.4	12.6
Providence	1,289	97.9	1.9	0.2
Skeldon	1,346	100.—	0.—	0.—
Total ..	15,035	99.1	0.2	0.7

It will be noted that the domesticity of *A. tarsimaculatus* is consistently negligible throughout the coast; only at Blairmont *A. albitarsis* was captured with a certain frequency; this is due to the fact that the greater part of our captures, on this estate, were conducted in the village of Rampoor, which is situated 4 miles inland, on the edge of the Abary cattle savannahs where this mosquito is often extremely abundant. In this locality we found that whereas *A. darlingi* was constantly present in the houses, in more or less consistent numbers, according to season, *A. albitarsis* would be found fitfully, sometimes being absent, usually representing only 3 to 5 per cent., but occasionally as much as 15 to 25 per cent. of the Anophelines captured. In the open, in this locality *A. albitarsis* was always and by far the most abundant species from May to November.

In this same locality we also noted that the great majority of *A. albitarsis* captured in houses showed no evidence of having recently fed. This is well shown in the accompanying photographs.

Table 1 demonstrates that *A. darlingi* is very definitely attracted to houses; this is evidently not the case for either *A. tarsimaculatus* or *A. albitarsis*. The two latter species not rarely may be caught in estate hospitals or staff houses, where they are attracted, like myriads of other night flyers, by the bright electric lighting.

It might be argued that this different incidence in houses may simply be an expression of the different general incidence of the three species in the localities we have studied. This is certainly not the case, as *A. albitarsis* and *A. tarsimaculatus* could always be found in numbers, when searched for in their habitual haunts; moreover, the collection of larvae in surface waters (which was always carried out systematically and in parallel with the capture of adults) showed the larvae of these species to be constantly equally numerous, and often very much more so than those of *A. darlingi*.

III.—BITING HABITS.

A. darlingi is strictly a night flyer, becoming active soon after dusk. It undoubtedly bites man selectively.

We have investigated the incidence of the various Anopheles in animal shelters such as stables, cow and sheep pens. In many instances we have carried out captures on horses tethered in the open in close proximity to houses in which *A. darlingi* was present in large numbers at the time.

The following table summarizes our findings :

TABLE II.

Locality.	Anopheles Captured.	RELATIVE INCIDENCE PER 100.		
		<i>A. darlingi.</i>	<i>A. tarsimaculatus.</i>	<i>A. albitarsis.</i>
De Kinderen]	67	11.9	85.1	3.-
Uitvlugt	67	0.-	98.5	1.5
Wales	14	7.-	93.-	0.-
Blairmont	1,883	2.3	52.5	45.2
Bath				
Providence				
Skeldon	135	5.2	3.-	91.8
Industry (Corentyne Coast)	533	0.-	99.1	0.9
Total	2,699	2.2	59.9	37.9

A. tarsimaculatus and, more especially, *A. albitarsis* when disturbed from their resting places in close proximity to their breeding sites, will frequently attack by day even in full sunlight.

On the back dam of the Western Berbice estates and on the Abary savannahs *A. albitarsis* may be very troublesome even by day.

All our observations, in conclusion, tend to show that *A. darlingi* is definitely *anthropophilous* in its feeding habits, *i.e.*, it feeds on man selectively and, to this purpose, it enters and rests in houses in large numbers and, presumably, if conditions are favourable, it may fly considerable distances in search of its favourite meal.

A. tarsimaculatus and *A. albitarsis* are on the contrary, strictly *zoophilous*, *i.e.* they feed selectively on animals; for this reason their favourite haunts are animal shelters of various description.

IV.—CONCLUSIONS.

Reviewing the data which have been presented in this and the previous section, we are led to the following conclusions:

(1) There are three species of *Anopheles*, in this Colony, which by their number and wide distribution must be regarded as possible vectors of malaria. These species are *A. tarsimaculatus*, *A. albitarsis*, and *A. darlingi*. The existence of the latter two species in this Colony was not previously known, both having been confused under the erroneous denomination of *A. argyritarsis*, a species which, though valid, we have failed to find in British Guiana.

(2) An investigation on the local geographical and topographical distribution of these three species of *Anopheles* reveals that the distribution and incidence of malaria is strictly parallel to the distribution and incidence of *A. darlingi*, a species which enters houses and feeds on man selectively. *A. tarsimaculatus* and *A. albitarsis* abound in localities which are habitually free from endemic malaria: when malarial epidemics occur we have always been able to demonstrate the presence of *A. darlingi*; the severity of such epidemics is directly proportionate to the incidence of this mosquito.

(3) *A. tarsimaculatus* and *A. albitarsis*, which abound on the pastures, sugar and rice plantations and on the savannahs of the Coast and far interior, bite animals selectively and cattle in particular. They enter stables and cow-sheds in search of food; human habitations only accidentally. *A. albitarsis* even when caught in houses rarely shows evidence of having fed on the occupants. The absence of endemic malaria in localities where only these two species abound, as at Bath and on the Corentyne Coast, is easily explained; these species, by feeding selectively on animals, are not liable to acquire and thereby, subsequently, transmit malarial infection.

(4) We have ourselves been able, with difficulty, to infect in the laboratory locally bred *A. tarsimaculatus* and *A. albitarsis* with local strains of malaria parasites (*P. vivax*), but we are of opinion that the importance of both these species is negligible from a malariological standpoint: in order to be an effective carrier a mosquito must bite not once but repeatedly; it must feed, in the first place, on a human subject harbouring malaria parasites in a suitable phase; after an incubation period of at least 10 days the mosquito becomes infective, but, evidently in order to transmit malaria again to one or more persons it must again feed on man, on one or more occasions. The figures and observations we have recorded which we believe, are based on adequate material, were collected over an adequate field and for an adequate period, evidently show that both for *A. tarsimaculatus* and *A. albitarsis*, the likelihood of such repeated attacks on man by an individual mosquito is sufficiently remote or, at least, unusual to lose all practical importance.

(5) We, therefore, ultimately conclude that *A. darlingi* is the sole malarial vector of practical importance in this Colony.

PART III.—BREEDING HABITS OF *A. darlingi*. NATURAL FACTORS WHICH LIMIT THE DISTRIBUTION OF THIS SPECIES AND OF MALARIA.

We have established in the previous sections that *A. darlingi* is the sole malarial vector of practical importance out of the three local common Anopheles; we will now proceed to study the breeding habits of this species as such knowledge is essential for the carrying out of an intelligent control policy.

BREEDING HABITS OF *A. darlingi* IN THE INTERIOR:

We have seen that *A. darlingi* is the main malarial vector throughout equatorial South America; it is eminently an inhabitant of the vast inland forest districts of this region.

Our observations, in this Colony, have been carried out on the mid and upper Demerara, mid-Essequibo and Potaro Rivers. These districts offer good examples of the various conditions which exist in the interior, as regards surface water régime.

The Demerara River is subject to tidal variations for a distance of close on 100 miles from its mouth, where the first rapids are found. The river banks are formed by low, alluvial mud flats entirely covered by forest. The first sand dunes, which are also covered with dense vegetation, rise 25 miles from the sea and extend some 50 or 60 miles, when higher hills and rock formations make their appearance. The mud flats present a somewhat higher bank or dam bordering the river; on this all the settlements are placed.

The flats tend to get lower as one proceeds from the river bank towards the foot of the sand dunes, where extensive forest swamps are usually to be found. Some of these swamps are subject to regular tidal invasion from the river; their waters are limpid, soft, dark brown in colour, and very acid (pH 4 to 5). They are very poor in algae and other vegetation; the naked, black submerged trunks and limbs (Tacobas) have a characteristic charred appearance; planktonic life also appears to be remarkably scarce.

Acid, peaty waters of this description form a very large proportion of all surface waters in the interior; they appear to be unsuitable for the breeding of *A. darlingi* as we have never found them harbouring larvae of this species.

In some localities, white water springs exist at the foot of the sand hills; in the absence of direct communication with the river or with brown water creeks, clear white water swamps are formed; such waters are only slightly acid, and sometimes neutral in reaction (pH 6 to 7). Vegetation of all kinds is here more abundant, and green algae are frequently noted, covering the submerged logs. These white water swamps are favourite breeding sites of *A. darlingi* being permanent they are particularly dangerous, and in their neighbourhood we have found this species all the year round (Figs. 1 & 2).

During the heavy rains, from May to July, extensive rain water swamps collect in low places not subject to tidal invasion; these too form suitable breeding sites for *A. darlingi*. Finding the larvae is a laborious task as their dispersion is very great. When the dry weather sets in, most of these rain water collections disappear; in others the characters of the water gradually change through prolonged contact with decaying vegetation, and they become acid and unproductive of Anopheles (Fig. 3).

In conclusion:

The acid dark waters of the tidal rivers and of the black forest creeks and swamps, tidal or otherwise, are permanently unsuitable for the breeding of *A. darlingi*.

Rain water collections and swamps are suitable; they give rise to only temporary or seasonal breeding.

White water seepage swamps and creeks are dangerous and more or less permanent and productive sources of *A. darlingi*.

Besides the physio-chemical characteristics of the waters, other factors influence the breeding of *A. darlingi*.

Fairly large volumes of water are preferred; a fair combination of shade and direct sunlight appears to give optimum conditions; a certain amount of cover in the form of vertical vegetation and floatage are required.

The seasonal factor is also important; breeding is active during the warm weather following the spring and early summer rains; it is scarcely affected by the autumn rains. These, in fact, actually appear to have an unfavourable bearing on the survival of the adult Anopheles from one season to another; conversely, failure of the November-December rains is often a prelude to an unusual Anopheline and malaria prevalence in the following summer.

Man-made breeding sites are of little moment along the tidal rivers. The Berbice, Pomeroon and Moruka rivers all present similar characters to those we have described on the Demerara.

The mid-Essequibo river is subject to regular, periodic floods; the pulse of these floods is regulated by the rainfall over large tracts of land in the far interior. In these continental

areas the distribution of the rainfall is much more characteristic and constant than on the coast ; there is a single and well defined rainy season, from May to August.

These Essequibo floods, therefore, as the inland rainfall which causes them, are regularly periodical, reaching their peak in the month of August. During the floods hundreds of square miles of forest are submerged over the 600 mile course of this great river.

The waters of the Essequibo are of a very light brown colour, and their reaction is only slightly on the acid side. These physio-chemical features vary considerably along the course of the river according to the characteristics of the waters of the larger tributaries. The Potaro, for instance, brings to the Essequibo a large volume of dark brown acid water, and the two currents keep separate for some miles after their confluence.

The mid-Essequibo valley is flooded during the local early summer rains. These local rains, conversely to what occurs on the tidal rivers, can have little or no importance as regards the breeding of *Anopheles*. We found at Rockstone and Butukari that *A. darlingi* made its appearance during and immediately after the floods, when the falling river waters left behind extensive swamps presenting favourable conditions for the breeding of this species. Here again the finding of larvae is a difficult task owing to their wide dispersion.

At Rockstone *A. darlingi* is particularly abundant, as the small clearing, surrounded by forest, offers those conditions of shelter, shade, and sunshine which we have already described.

This peculiar complex of conditions which prevail on the mid-Essequibo causes the seasonal incidence of *Anopheles* and of Malaria to be remarkably regular.

These are the reasons for which the epidemiology of Malaria differs profoundly from one district of the interior to another : in 1926, for instance Malaria prevailed in severe epidemic form throughout the Demerara and other tidal river districts, yet Rockstone and Butukari on the Essequibo, less than 20 miles away, were in no way affected. All these districts experienced that year the same abnormality in the distribution and abundance of rainfall ; but while on the Demerara these rains caused the production of a very unusual amount of suitable breeding sites at a particularly favourable season, on the Essequibo these same rains fell on a normally flooded valley, and the seasonal Anopheline and malarial exacerbation followed its usual course, after the flood, quite uninfluenced by abnormal local meteorological conditions.

On the torrential flood rivers, like the Upper Demerara and the Potaro, both of which have dark acid waters, the breeding of *A. darlingi* is essentially related to the rainfall. Where white water creeks and swamps occur permanent favourable breeding sites are provided.

In the Potaro and other gold and diamond mining districts, man-made breeding sites are of particular importance. Old gold pits filled with rain water and other artificial collections, as required for washing and sluicing for gold and diamonds, may all be productive sources of *A. darlingi* in close proximity to the miners' camps.

Bodkin (1921) states to have found *Anopheles* breeding in discarded tins and other containers in the Potaro district.

Both in that locality and elsewhere in the Colony, and over many years, we have completely failed to substantiate this claim. We have never found *A. darlingi*, nor *A. triseriatus* or *A. albivittatus* either, breeding in containers of any description ranging from rainwater vats to sardine tins and coconut husks.

Accurate statistics as regards the topographical distribution of *A. darlingi* and of Malaria in relation to the distribution of these various types of surface waters in the interior are not available for the present. It is certain that the incidence of Malaria varies very considerably from one locality to the other. In our own experience, on the Demerara, swamps due to white water springs of low acidity were constantly associated with a high Anopheline incidence and with severe endemic Malaria.

BREEDING HABITS OF *A. darlingi* ON THE COAST.

Surface water conditions on the Coast are varied and different from those of the interior, owing mainly to the very low level of the land, and to its being settled and cultivated.

A very large porportion of the inhabited coastal belt lies below high tide sea level. It is liable, therefore, to tidal flooding from the sea, and seasonal flooding from higher lands farther inland during the rains. From such contingencies this area is protected by sea defences and back dams. Drainage is carried out by means of a very extensive net of trenches which empty themselves into the sea, sometimes by gravity (during low tide only), more often through powerful pumping stations.

In East and West Demerara efficient sea defences exist along the shore line. Sea water infiltration is very small, being practically limited to leakage from the sea sluices at high tide. In Western Berbice and on the Corentyne, in particular, vast tracks of the front lands are open to regular tidal invasion and salt water finds its way for a distance of some miles inland.

Such tidal invasion, present and past, reflects itself in the salinity of the soils ; we find that on the East and West Coast of Demerara, there is only a narrow strip of salt land more or



FIGS. 1 & 2.—Typical breeding sites of *A. darlingi* in the interior: white water seepage swamps on the mid-Demerara River. Though apparently completely covered by luxuriant vegetation, the water is exposed to a certain amount of direct sunlight.

PLATE II.



FIG. 3.—Typical breeding site of *A. darlingi* in the interior. Rain water swamps in mid-Demerara.

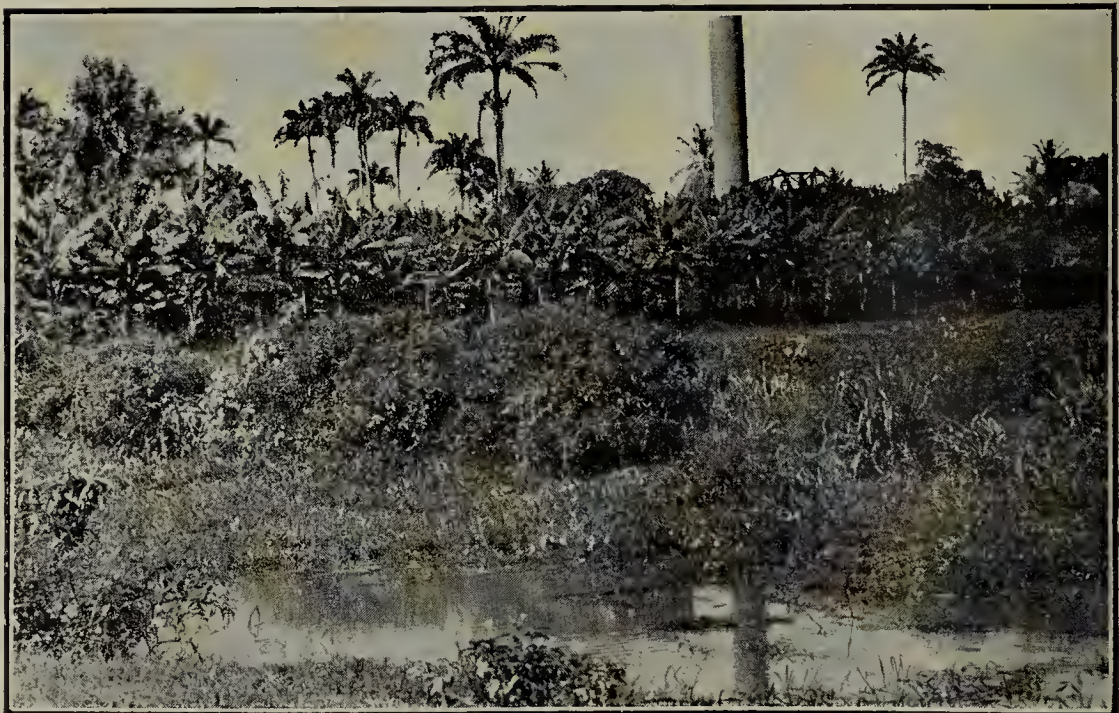


FIG. 4 —Abandoned factory sites, with bush covered foundation pits and obsolete canals, form ideal breeding sites for *A. darlingi*.

less corresponding to the front pastures, which extend for a depth of one mile from the sea wall at the most.

As one proceeds towards the east the coastal salt land belt becomes progressively wider. In Western Berbice, tidal waters in many places reach beyond the railroad line, and salt soils are found for a depth of two or more miles from the shore line.

On the Corentyne Coast, salt marshes extend a long way inland and the soils are rich in soluble salt for a very considerable depth. The waters which collect, during the rains, on the extensive savannahs lying aback of plantations Rose Hall, Albion, and Port Mourant, as the dry weather sets in, tend to become too salt for irrigation purposes. This occurs 10 or more miles inland.

We find, in conclusion, that a very large proportion of the surface waters of the coastal front lands are affected by tidal invasion or by contact with soils which are rich in soluble salts. The former are permanently brackish, (Corentyne front land marshes); the latter tend to become brackish during dry weather, by long contact and concentration through evaporation. (Corentyne back dam savannahs and front land rice fields; East and West Demerara salt front pastures).

The salt lands which are subject to regular or occasional tidal influx can usually be recognized by their characteristic vegetation: *Avicennia* (Courida); *Acrosticum* (Bear Grass) *Sporobolus* (Crab Grass); *Pistia* (Water Lettuce) and *Cyperus* (Bizzi Bizzi).

In the inhabited and cultivated belt, natural surface waters are represented mainly by flooded pastures and rain water collections; the great majority of surface water collections are made by man: these include drains and drainage trenches, irrigation canals, canefields in flood fallow, rice fields, ponds and burrow pits.

Our plan (Fig. 5) shows the usual lay-out of irrigation canals, drains and drainage trenches in cane fields. It gives an idea of the magnitude of the canal problem in this country. We have calculated roughly that for every square mile of cane cultivation (10-acre fields) there exist:

- 16 Miles of Irrigation Canals.
- 4.5 Miles of Drainage Side-lines.
- 45 Miles of 4 ft. Drains.

Drains and Drainage trenches rarely harbour larvæ of *A. darlingi* probably in consequence of the small volume of water in the former and the frequent flushing in the water. We have never found this species in the 4-foot and other smaller drains inside the cane fields; small open surface drains, around villages and estate yards, frequently harbour larvæ of *A. tarsimaculatus* and *A. albitarsis*, but only very exceptionally those of *A. darlingi*. In the front lands, many of the larger drainage trenches or "side lines" in dry weather, tend to become brackish owing to leakage through the sea sluices at high tide.

Irrigation canals are, without doubt, the most important from our point of view. They receive their water supply from water conservancies or from creeks lying aback of the cultivation. These canals also constitute the waterway by which cane is conveyed to the factories for grinding. The main canals are known as "middle walks;" at regular intervals these give off blind ending branches or "cross canals." (Figs. 6 & 7.)

The level of the water in the irrigation system is maintained constantly high by pumping. In the main canals, the water is subject to fairly frequent renewal, and it presents the general characters of the inland river and creek waters we have described, but considerable variation exists, according to locality.

We find that in Western Demerara the waters from the Borassiri and Hababoo conservancies and the Camooni Creek are very dark and very acid. (pH 4 to 5.5, sometimes even lower.) In East Demerara, the sugar estates receive their irrigation supply from the Lamaha conservancy; these waters are less acid. (pH 5.5 to 6.4 and over.)

Blairmont and Bath receive their water from the Abary; at the pumping station on this river, the pH. ranges from 6.4 to 6.8; the average of 330 pH estimations taken in all sections of the irrigation system of these two estates, at all seasons and over a period of 3 years, was 6.6. Readings under 6 were recorded only on 5 occasions, the lowest value being 5.2; readings over 7 were noted sixteen times with a maximum of 7.2.

Observations carried out at Port Mourant, on the Corentyne Coast, show similar pH values for the irrigation canals, which get their supply from the Canje river.

The sodium chloride content of the irrigation canal waters ranges, as an average, from 20 to 40 milligrams per litre; except in some front land sections in which readings of 30 to 100 milligrams per litre were sometimes noted.

In the middle walks the water is more frequently renewed; in the blind ending cross canals, it is quiescent; during the rains the reaction in the latter canals is often considerably less acid than in the middle walk. In these blind ends, or "bucket heads," floating vegetation such as floating grass (*Paspalum*), water hyacinth (*Pontederia*), *Salvinia*, and our floating

mimosa (*Neptunia*), tend to accumulate and spread. These cross canals, overgrown by vegetation and sheltered as they are by overhanging cane, when the pH reaction is above 5.8, are the favourite breeding sites of *A. darlingi*. Variation in pH reaction in these waters, brought about by closing or opening the conservancy sluices, or by excessive rainfall, undoubtedly affects the distribution and intensity of breeding of this *Anopheles* in the irrigation canals. Larvæ are usually absent in canals which are kept free from floating vegetation.

Flooded Fields: Flood fallowing is an important characteristic of the local technique of cane cultivation: after three or four crops have been taken off a cane field a small dam is thrown up around it and it is flooded and left to lie fallow for 6 months to 1 year. This practice has greatly increased the yield per acre and is, therefore, of vital importance to the local sugar industry.

Flood fallowing is also a feature of unusual importance to the malariologist: at any time from one-tenth to one-eighth of the cultivated land of an estate is flooded, often in close proximity to estate villages. For the first few months after flooding a considerable amount of fermentation occurs from the submerged cane tops and stumps: the water is brown and has a distinct odour; vegetation is scarce. At this stage we have never found flooded fields harbouring *Anopheline* larvae.

After three or four months vertical and floating vegetation appears and rapidly spreads mainly (*Paspalum*, *Pontederia*, *Salvinia*, *Neptunia* and *Limnocharis*). The waters become clear and their pH ranges usually from 6.2 to 6.8; the rains have an important part in bringing about this change in the characters of the waters. At this stage flooded fields often become very productive sources of *A. darlingi*. In some localities we have completely failed to find larvae of this species in spite of apparently favourable conditions. Abnormally high salinity of the waters (100 milligrams per litre) or lack of shelter and general situation and exposure of the field sometimes explain these negative findings (Fig. 8).

Rice Fields: Rice is cultivated throughout the coast, around and in the immediate neighbourhood of most villages, on sugar estates and on some of the creek savannahs. According to locality this cultivation is dependent on the rainfall, on the irrigation system of sugar estates or on the seasonable creek floods. Planting is done between March and June; the fields are under water from May to August; reaping takes place in September and October. Usually only one crop is planted and after reaping the fields are left to themselves till the following season, most of them being flooded during the Autumn rains.

When the growth of the rice is well advanced rice field waters are usually clear and light brown in colour; pH ranges from 6 to 7; their content in soluble salts varies within wide limits: in most front land fields the sodium chloride content is frequently well above 100 milligrams and sometimes amounts to several grams per litre; further inland it is usually low, 15 to 50 milligrams.

The full grown rice plant offers good protection to mosquito larvae at its base, in between the stems. Larvae of *A. tarsimaculatus* are practically always present and abundant. *A. albivittatus* occurs when the salinity is low. Under the latter conditions *A. darlingi* may be found, sometimes in large numbers, when the rice fields are sheltered by surrounding trees and vegetation which form wind-screens and offer a certain amount of shade. This species is practically never found in the rice fields of the open, windswept front lands as exist on the East Coast, north of the sugar estates and, more particularly, in Eastern Berbice (Figs. 9 and 10).

Burrow Pits: These exist in great numbers the length of the coast along the rail and public roads; scores are dug every year for the preparation of burnt earth. Fortunately they are nearly all located in the windswept, salt front lands and though very productive of *Culex* mosquitoes and *A. tarsimaculatus* they form unlikely breeding sites for *A. darlingi*. During heavy rains and where suitable shelter exists burrow pits also may become dangerous breeding sites for *A. darlingi*.

On sugar estates abandoned factory sites, with bush covered foundation pits and obsolete canals, often present excellent conditions for the breeding of the dangerous malaria carrier. (Fig. 4).

Ponds: These are particularly common in villages where, in the absence of irrigation canals, they are used for storing rain water for domestic purposes. *A. tarsimaculatus* is nearly always present; *A. darlingi* may occur when the water is clear and sweet and if suitable shelter exists.

Flooded Pastures: Beyond the coastal salt land belt, flooded pastures when sheltered and rich in vertical and floating vegetation are dangerous; the same may be said of the bush covered rain swamps which collect on sand reefs and other abandoned lands.

In the salt front lands, where *A. darlingi* is usually not found breeding, this species may occur, sometimes in considerable numbers, during heavy and persistent rains which affect both the physio-chemical characteristics of the waters and atmospheric humidity.

From this brief review it will be noted that a very large proportion of the water collections

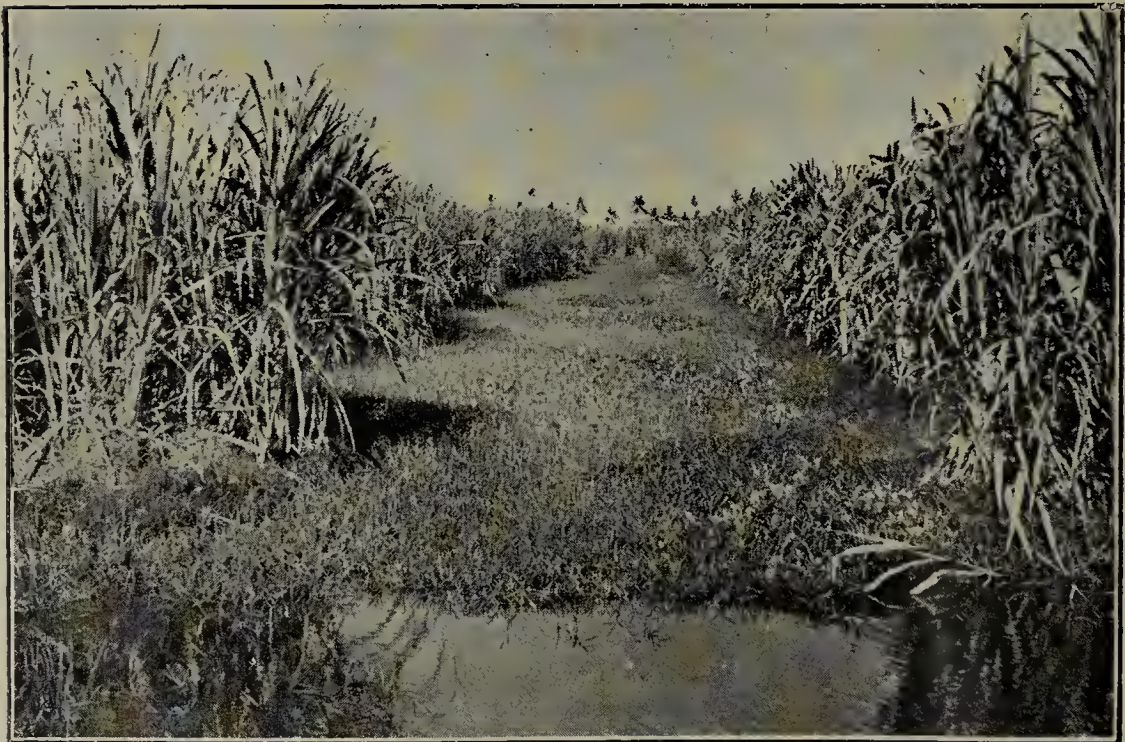
DUTCH LAY-OUT.

ENGLISH LAY-OUT.



FIG. 5.—Plan of irrigation canals, drains and drainage trenches in a group of four sugar cane fields. The disposition of the small drains within the fields varies, and the two usual lay-outs, Dutch and English, are shown. A square mile of land laid out as above in 10 acre fields, would include 16 miles of irrigation canals; $4\frac{1}{2}$ of drainage trenches and 45 miles of four-foot drains.

PLATE IV.



FIGS. 6 & 7.—Typical breeding sites of *A. darlingi* on the coast. Irrigation canals, sheltered by overhanging cane and covered with floating vegetation in which the larvæ and pupæ find protection from the attacks of larvivorous fish.

which favour the breeding of *A. darlingi* on the coast are *man-made* and that they are essential and therefore, unavoidable factors in the basal agricultural industries of the Colony, sugar and rice.

Most of these surface waters, (irrigation canals, flooded fields and many rice fields) are not dependent on seasonal factors such as rainfall and floods; they are permanent, and as such offer, the year around, favourable conditions for the breeding of Anopheles. Though season evidently still plays an important part in the intensity of Anopheline breeding, we have found that *A. darlingi* on the coast can be collected, both in its adult and developmental phases, throughout the year. In the interior we observed this to occur only in proximity of white water seepage swamps which offer permanent and suitable breeding sites. This is evidently the reason why on those parts of the coast which are subject to endemic malaria, the seasonal incidence of this disease is very much less clearly defined than in the interior.

Both in the interior and on the coast our findings tend to demonstrate that the breeding of *A. darlingi* is restricted to certain types of surface waters. This species has a preference for water collections of considerable size. There evidently exist certain characteristics of surface waters and soils which are not congenial to this species and which, therefore, tend to limit its dispersion. We believe that the following are some of such limiting factors.

Reaction of Surface Waters: *A. darlingi* is only exceptionally found in waters with a pH value under 5.8; the optimum range is from 6.2 to 6.8.

At Cane Grove, in spite of general conditions which would at first lead one to expect the existence of severe malaria, we have found this disease only mildly endemic (spleen rate 16.1% and parasite rate 15.9% in 1937). The soil in this locality is exceptionally acid. In April this year we found the pH of irrigation canal waters ranging from 5.2 to 5.4; in some stagnant drainage trenches we obtained readings as low as 3.5. We failed completely to find adult *A. darlingi* in the houses or its larvae in any of the surface waters, in spite of the fact that this species was at that time abundant all along the East coast.

At Wales, an estate with a particularly bad malarial reputation, the incidence of this disease has shown a very distinct drop since 1934, coincidently with the opening of a canal from the Camooni Creek to Hababoo conservancy which supplies the irrigation canals of this estate. Camooni waters are very acid (pH 4.26 to 4.47 in April 1938). In August 1937, (with the Camooni and Hababoo sluices open) in a search lasting several days, we completely failed to find larvae of *A. darlingi* in the irrigation canals of this estate (pH 5.2), but we found them common in the flooded fields (pH 6.2 to 6.6). In April this year, during heavy rains, with all the conservancy sluices shut, we found only a few larvae of this species at the bucket head of a cross canal (pH 5.8) at the same time in flooded fields and in the same locality (pH 6.6) larvae could be collected at every dip.

In the interior a very large proportion of surface waters are strongly acid and we believe that from a malariological standpoint they are not dangerous, we have in fact, successfully controlled productive breeding sites by opening them up to tidal invasion by acid river and creek waters.

Salinity: *A. darlingi* is only rarely found in waters which contain over 100 milligrams of sodium chloride per litre. On the Berbice estuary in three years we made only one such observation, the sodium chloride titre being 184 milligrams per litre.* The usual range is 20 to 60 milligrams, but in the laboratory we have raised this species, from ovum to adult, in water containing 300 milligrams per litre.

On the coastal front lands and on the Corentyne in particular very extensive tracts of marshes are permanently and definitely brackish; other vast areas of surface waters become so in the dry weather through contact with salt soils and evaporation. Most of the rice cultivation in the Berbice front lands falls in this group. All such waters, as not productive of *A. darlingi*, can be overlooked in the carrying out of an anti-malarial campaign.

Atmospheric Humidity: This too we believe is an important factor which limits the range of *A. darlingi*: the adult of this species is very susceptible to desiccation and exposure to the strong coastal breeze rapidly kills it.

Some localities, though presenting apparently ideal surface waters, under ordinary meteorological conditions are practically free from *A. darlingi* and from endemic malaria. Plantation Bath is a good example; the canals and flooded fields of this estate receive their

* Since the present article was written, we have found *A. darlingi* breeding in water with a sodium chloride content of slightly over 3 grams per litre, at La Bonne Intention, on the East Coast.

Larvae and pupae were found in a canal communicating with the dammed off terminal portion of the main middle walk which, during the rains, is used to blow off to sea, through a sluice, excess water from the irrigation system.

When this canal is stopped off from the main irrigation system as at present, at high tide salt water leaks through at the sluice gate.

We have found that the salinity in this canal and at the same spot where the larvae were discovered varied within wide limits, in the course of only 5 days the sodium chloride falling progressively from 3.650 to 0.400 milligr. per litre.

The breeding of *A. darlingi* in water of such high salinity certainly remains a very unusual occurrence.

waters from the same Abary pump which supplies Blairmont, a notoriously malarial locality. We studied these two estates comparatively for three years (1934-1936) and came to the conclusion that the drier atmosphere at Bath was responsible for the absence of *A. darlingi*. It should here be remembered that this mosquito is a strict night flyer and mainly a native of equatorial forest regions where the night atmosphere is more or less constantly saturated with moisture.

We attribute the habitual freedom of the Corentyne coast from *A. darlingi* and endemic malaria to a relatively higher atmospheric dryness and to the salinity of the surface waters and soils throughout the inhabited belt.

The well defined seasonal malarial epidemics which have occurred at Bath and on the Corentyne coast following the very exceptionally wet seasons of 1937 and 1938 tend to confirm our views.

The factors which we have listed as controlling influences on the breeding, and therefore on the dispersion of *A. darlingi*, exercise no similar influence on the other local common Anopheles. This is particularly the case for *A. tarsimaculatus* which presents the most remarkable latitude in the choice of its breeding sites: we have found this species breeding actively and evidently flourishing in waters the pH. of which ranged from 4 to 7.8 and the sodium chloride content from 0.005 to 28 grams per litre. With such extraordinary adaptability practically *all* surface waters of this Colony are suitable for this species if cover is provided in the form of vegetation or floatage for the protection of the larvae from their natural enemies. Evidently the control of this species on the coastlands of Guiana would be a very arduous, not to say hopeless task. Fortunately this control is not required as this species locally does not act as a carrier of Malaria.

We have thus concluded the study of the entomological aspects of the local malarial problem in its principal lines.

Our findings are encouraging as only a single kind, out of the several local Anopheline species, emerges from this investigation definitely indicted with the transmission of malaria in this Colony. We have also found that *A. darlingi* has certain selective breeding habits and that its range of flight is equally subject to certain limitations.

These findings infinitely simplify the malarial prevention problem, for they allow us to direct our effort against well defined objectives with a good knowledge of the vulnerable points in the enemy's defences.



FIG. 8.—Flooded fields lying fallow, when covered with floating and vertical vegetation and favourably exposed, may be productive sources of *A. darlingi*.

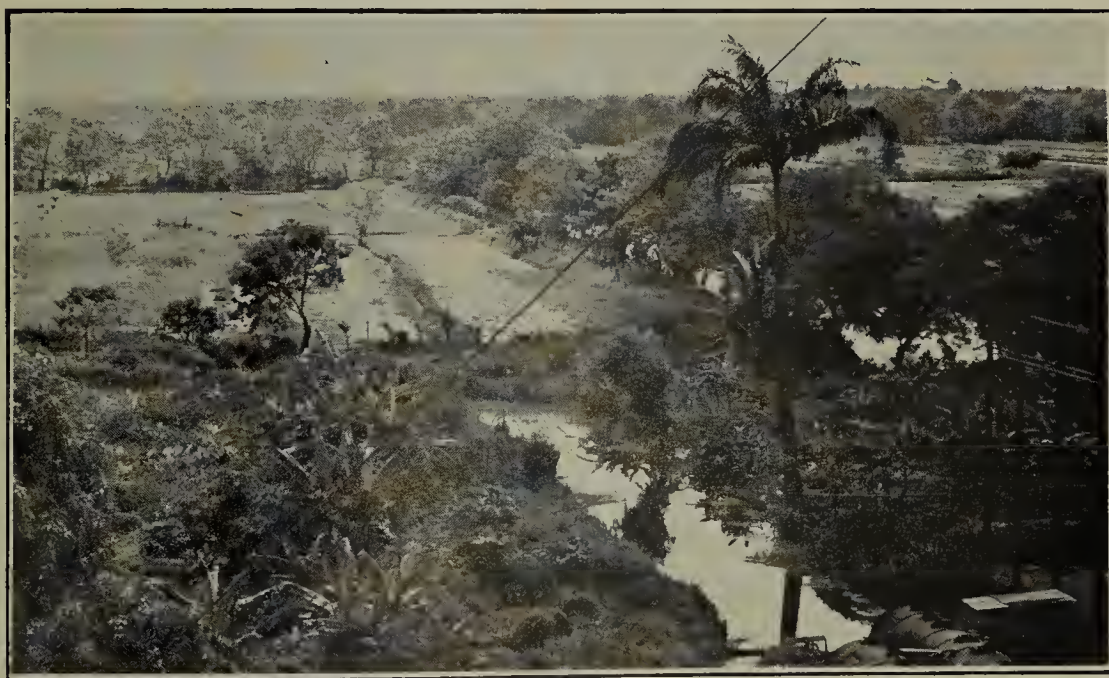


FIG. 9.—Rice fields situated beyond the salt coastal front lands, and sheltered by trees and scrub, are favourite breeding sites of *A. darlingi*.

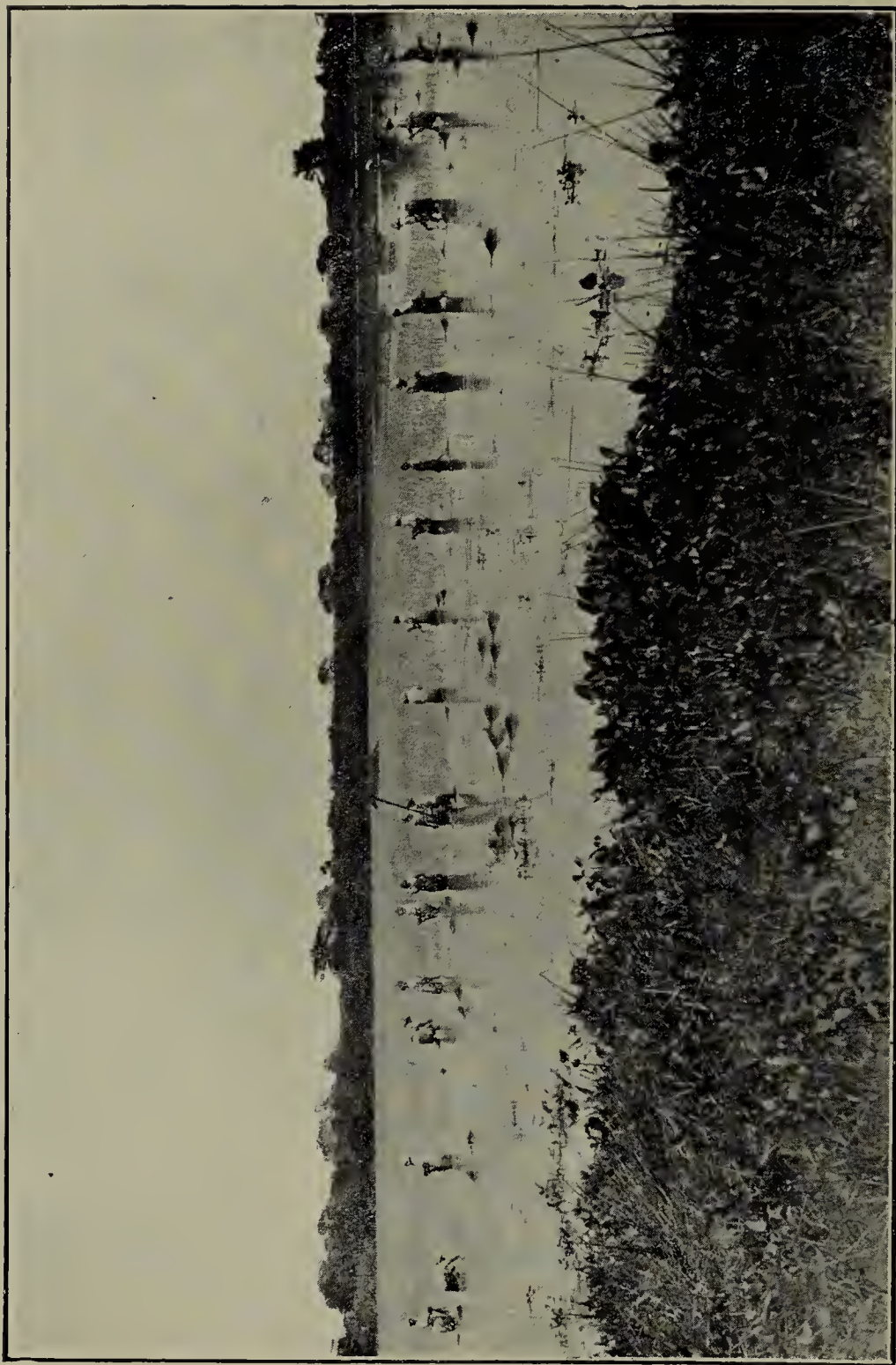


FIG. 10.—Open, windswept rice fields in the salt coast front lands are favourite breeding sites of *A. tarsimaculatus*, but only very exceptionally harbour *A. darlingi*.

PART IV.—THE DISTRIBUTION OF MALARIA ON THE COASTLANDS. GENESIS OF MALARIAL EPIDEMICS.

In the previous sections, the life history of *A. darlingi*, the local malarial vector, has been studied and the existence of certain factors ascertained, which tend to limit the distribution of this species and its seasonal incidence. Some of these factors, as water and soil salinity and acidity, influence this mosquito in its developmental stages, and thus limit the extent of its breeding areas; others, such as atmospheric humidity and air movement, act directly on the adult insect and tend to influence its range of flight and its survival.

We have attributed the uneven distribution of malaria throughout the Colony to variations in these factors. High soil and water salinity or acidity, atmospheric dryness and active air movement are all factors which are inimical to *A. darlingi*. Conversely, soils and surface waters of low salinity and only slightly acid, or neutral in reaction, offer suitable breeding sites; a humid and quiet atmosphere will allow the adults of this species to fly over a much wider range and will favour their survival for a longer period.

On the West Coast of Demerara the land is sufficiently high to allow natural drainage by gravity. The salt soil belt is very narrow and the cane cultivation and rice beds, with their net of irrigation canals, extend right up to the public road; high courida (*Avicennia nitida*) and other bush, and the thick groves of coconut palms, mangoes and other fruit trees which mark the nearly continuous ribbon-like village which extends for many miles along the public road, form efficient wind barriers. *A. darlingi* finds suitable breeding and living conditions right up to the sea wall and malaria is more or less highly endemic throughout this whole coastal section.

On the East Coast of Demerara the land is lower, and natural drainage by gravity is not possible; surplus surface waters must be disposed of by pumping. The front land soils are salt and their surface waters brackish. For this reason these lands are mostly uncultivated and used only for pasturage.

At Ogle the salt front lands extend for approximately 1 mile south of the sea wall; this belt tends to become broader proceeding eastwards along the Coast.

The malaria rate, which is high on the estates situated nearer Georgetown, tends to fall progressively as the salt belt gets wider, and a larger proportion of the estate population resides in the salt front pastures. (Lusignan, Enmore, Non Pareil).

On the West Coast of Berbice the land is low, and the Sea Defences less efficient; Sea water in many points invades lands situated south of the public road and railway. These are the healthiest costal localities west of the Berbice Estuary (Litchfield, Bush Lot, Hopetown).

At Bath, the only sugar estate on this section of the coast, between 1934 and 1937, the spleen rate averaged only 8.6, and in 1937 it was as low as 1.5%.

On the Corentyne Coast as an average, the climate is drier; the locality is notorious for its constant and high breeze. The width of the salt belt runs into miles; the rice fields lying south of the public road are salt and windswept; tree vegetation is very scanty and poor. At Albion and Skeldon the cane cultivation borders on the yards; at Port Mourant nearly 3 miles of rice lands separate the cane cultivation from the estate village. The Corentyne Coast is usually free from endemic malaria.

Diagram No. 1 shows the distribution of malaria, as indicated by the spleen rate, throughout the Guiana Coast—between the Essequibo and Corentyne estuaries—at the end of 1937; the tendency of the rate to fall progressively from west to east is well shown. The average rainfall also shows a similar tendency, there being a difference of no less than 33 inches between the West Coast of Demerara and the Corentyne. No data are available as regards atmospheric humidity and air velocity for a comparative study of these factors throughout the Coast; the meteorological observatories of Georgetown and New Amsterdam are both situated on river estuaries. From general experience we believe it is safe to assume that the Corentyne coast is both drier and windier.

It is usually believed in the Colony that the right bank of the river estuaries (Demerara and Berbice) is healthier than the left, and our findings tend to confirm this belief to some extent. On the estuaries, in general, conditions appear to be more favourable than on the coast for the breeding of *A. darlingi*, as the land is relatively higher and less salt, the cane cultivation extending nearly to the river banks. The night atmosphere is also damper, and morning mists are frequent; malaria tends to be highly endemic.

Diamond Estate—on the right bank of the Demerara River some 11 miles from its mouth—and, to some extent, the village areas situated to the south of this plantation form a very notable and interesting exception which we are at present investigating.

The distribution and incidence of malaria throughout the coast, as shown in diagram 1, can be accepted as what usually obtains under average condition, but occasionally, at intervals of 10 or more years, with a general exacerbation of malaria throughout the Colony, severe

epidemic outbreaks occur also in localities which are usually free from the disease, notably on the Corentyne Coast. Similar outbreaks were observed in 1926 and 1938: both these epidemics we ascribe to abnormal meteorological conditions which prevailed during those years, which favoured the breeding of *A. darlingi* even in localities where this species is usually not found.

Let us now briefly examine which are these meteorological factors which favour the multiplication and dispersion of *A. darlingi* and thus give rise to malarial epidemic outbreaks.

Diagram No. 1 shows the average rainfall at various points along the coast at Uitvlugt (1916-36), Ogle (1906-36), La Bonne Intention (1916-1936), Enmore (1913-1936), Bath (1900-37), Albion (1865-1936), Port Mourant (1880-1936), and Skeldon (1906-36).

These averages, from our particular point of view, have relatively little value, as the annual range of deviation is very considerable and irregular. In table I the annual rainfall at Bath Estate, from 1900 to 1938, is shown as an example. One notes that the annual rainfall varied within the extreme limits of 51.83 inches in 1913 and 128.46 inches in 1938.

TABLE I.
ANNUAL RAINFALL AT BATH, WEST COAST, BERBICE, 1900-1938.

Year	Rainfall in inches	Year	Rainfall in inches
1900	85.56	1920	53.12
1901	61.29	1921	74.34
1902	76.38	1922	84.45
1903	92.83	1923	72.04
1904	57.72	1924	74.32
1905	65.73	1925	52.03
1906	89.48	1926	54.17
1907	93.74	1927	104.74
1908	73.94	1928	76.86
1909	66.29	1929	79.08
1910	84.07	1930	81.52
1911	—	1931	69.84
1912	67.53	1932	98.29
1913	51.83	1933	115.30
1914	55.04	1934	67.99
1915	77.25	1935	95.02
1916	89.91	1936	104.35
1917	81.64	1937	87.28
1918	68.38	1938	128.46
1919	72.08	—	—
Annual Average		77.17 inches	
Annual Maximum (1938)		128.46 inches	
Annual Minimum (1913)		51.83 inches	

The total annual rainfall has relatively little importance from a malariological point of view; we find, for instance, that malarial epidemics occurred both in 1926 and 1938 with rainfalls of 54.17 and 128.46 inches respectively; conversely in 1933 with a rainfall of 115.30 inches no epidemic was observed. *The seasonal distribution is what matters.*

Heavy atmospheric precipitation during the late autumn and winter months, when the atmosphere is cooler and the trade winds strongest, is never associated with an increase in the number of Anopheles; on the contrary, such rains appear to influence adversely these insects, and their number rapidly falls, the minimum incidence being observed in February and March.

The incidence of malaria invariably declines during October, November and December, the healthiest months in this respect being February, March and April. The exceptionally heavy rainfall in December of 1933 and January 1934 which caused disastrous floods did not produce any appreciable rise in the incidence of Anopheles and consequently of Malaria.

Failure of the autumn-winter rains is undoubtedly favourable to the survival of large numbers of *A. darlingi*; a drought at this season is often the prelude to a malarial epidemic later in the year.

The spring-summer rainy season which usually comes on in May and coincides with the period of highest atmospheric temperature and with the fall of the trade winds, always gives rise to active Anopheline breeding. If these rains are steady and continue throughout July and August, and possibly into September, especially if the temperature is unusually high, the breeding of *A. darlingi* becomes both extensive and intensive, and the incidence of malaria rapidly rises.

In localities which are usually free from malaria, and where under normal or average conditions, the physio-chemical properties of the surface waters are such as to render them unsuitable for the breeding of *A. darlingi*, the diluting action of heavy and persistent rains may so alter their characters as to transform them into attractive and productive breeding sites. During heavy rains, in July 1938, we found, for instance, *A. Albitarsis*, usually an inland savannah species, abundant and breeding actively in rain water collections situated outside the sea wall at Bel Air.

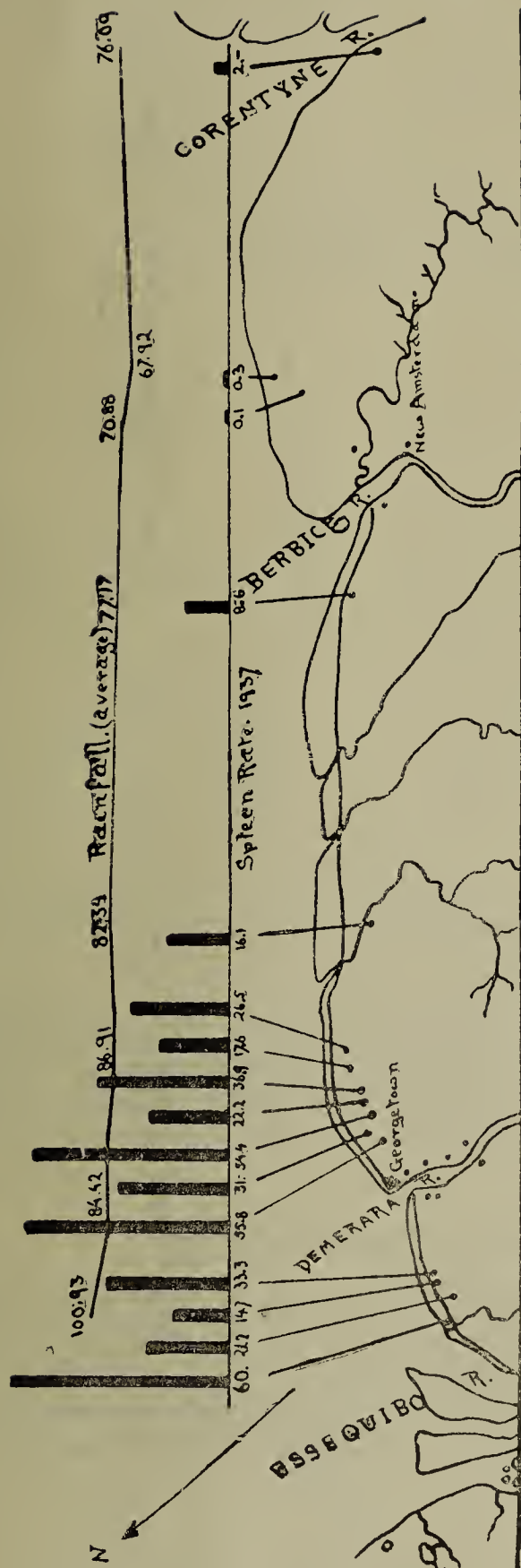


FIGURE 1.—Distribution of Malaria along the Guiana coast between the estuaries of the Essequibo and Corentyne Rivers. The average rainfall at various points along the coast is also shown. The spleen rates were taken in 1937, *i.e.*, before the unusual epidemic outbreaks of 1938. Note the tendency of the spleen rate to fall progressively from west to east. The Corentyne coast under normal or average conditions is practically free from endemic malaria.

PLATE II.

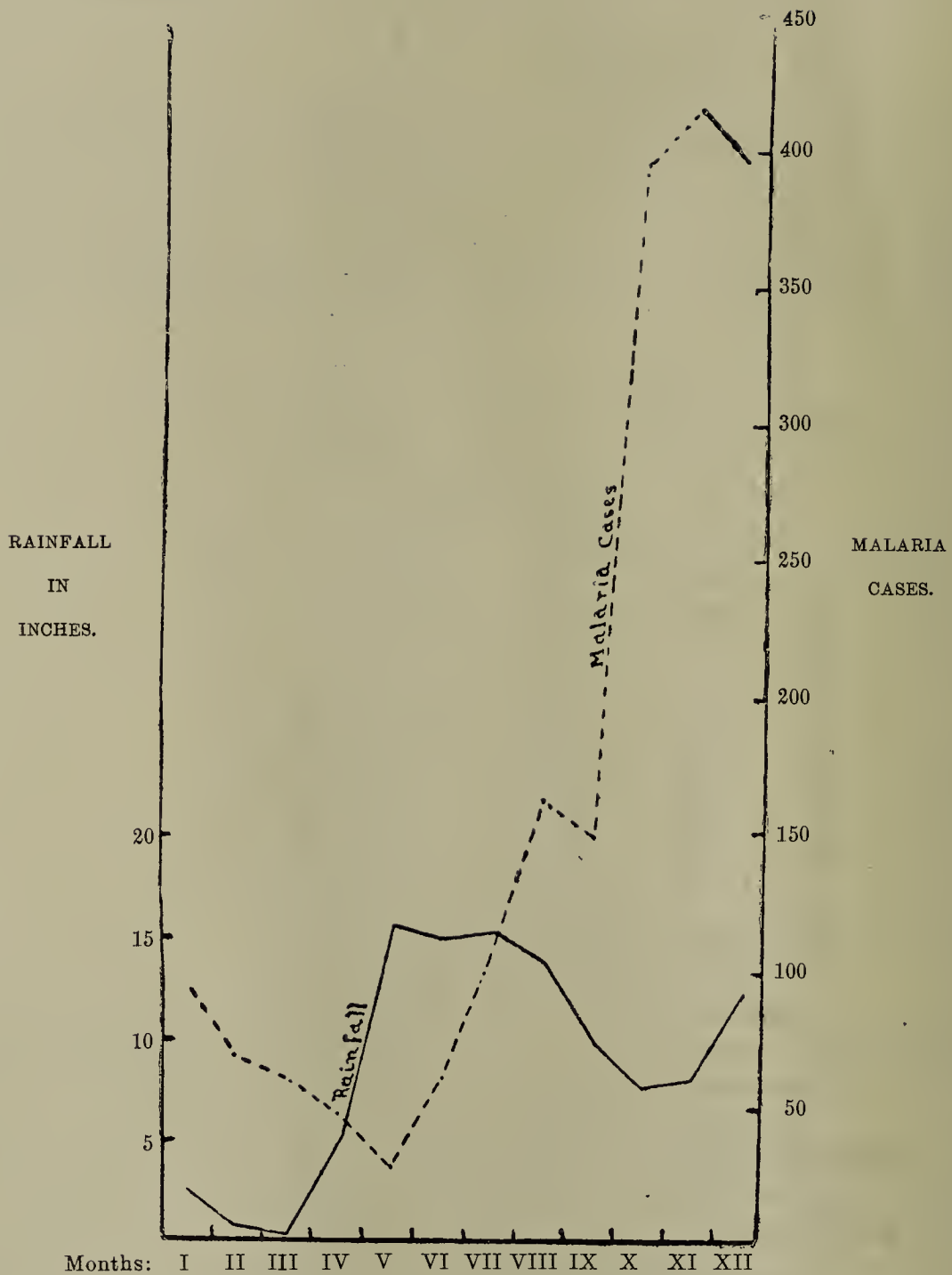


FIGURE 2.—In the tidal river districts of the interior August and September are usually dry months; the seasonal character of malaria is more distinct than on the coast, as the breeding of the carrier, *A. darlingi*, is mainly dependent on the early summer rains. In 1926 a severe drought was experienced during the first three months of the year, but heavy rains followed lasting from May to September with abnormally high atmospheric temperature. *A. darlingi* appeared in very large numbers and a severe malarial epidemic resulted which affected these districts for the following two years. Our graph illustrates the trend of the rainfall and malaria incidence curves as registered at Mackenzie, on the Demerara River, in 1926.

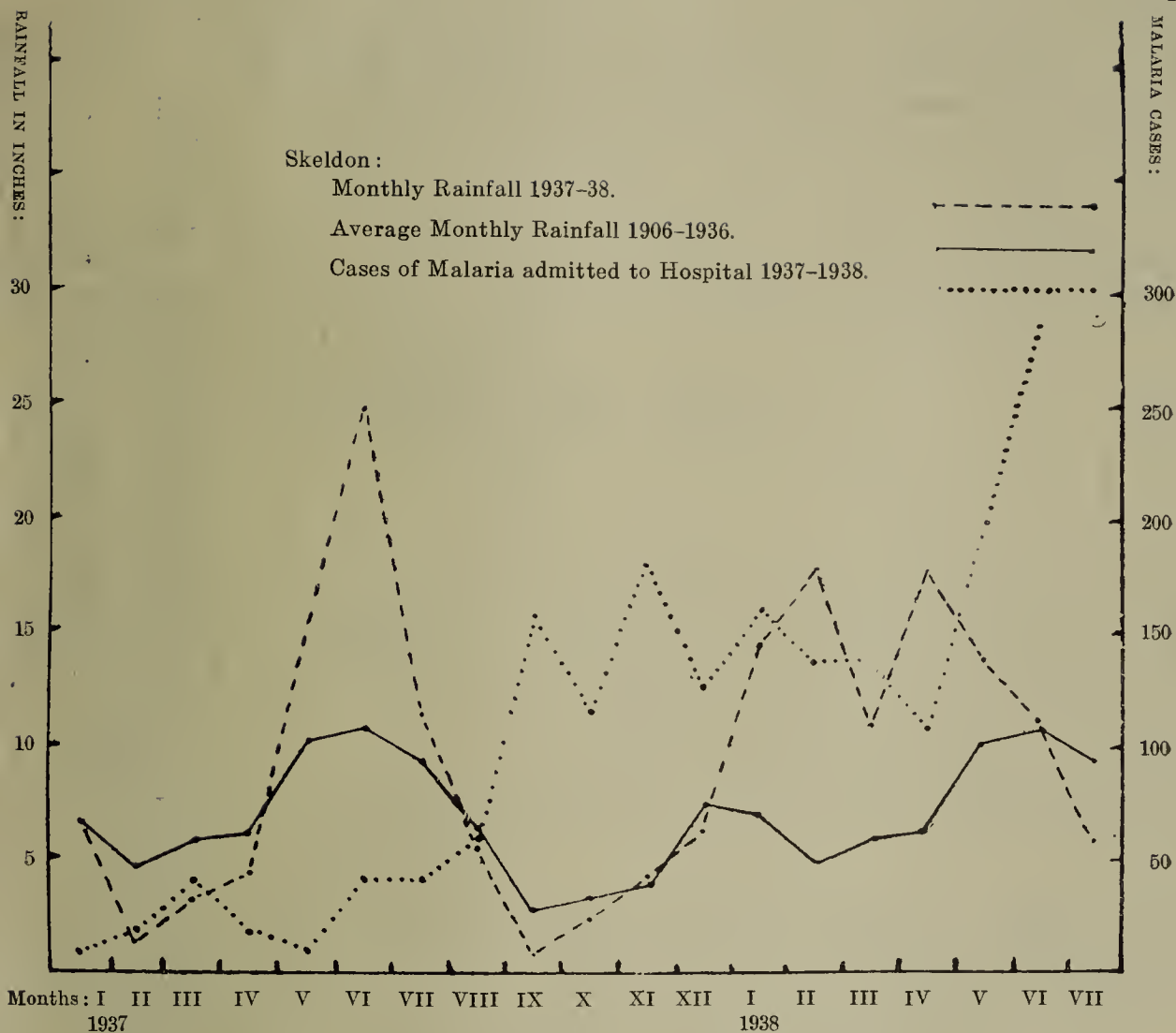


FIGURE 3.—In 1937 the spleen rate at Skeldon, on the Corentyne Estuary, was only 2%. A small outbreak of malaria occurred in September 1937, following the abnormally heavy rainfall in May, June and July. In 1938 the rainfall was even higher and more persistent, and in June the number of malaria cases seeking treatment at the hospital rose steeply to 300; in the second half of August over 1,300 cases of malaria were recorded. *A. darlingi* was extremely prevalent. At the end of 1938 the spleen rate at Skeldon had risen to 31%. This diagram shows comparatively the average (1906-1936) and the 1937-1938 rainfall, along with the number of cases of malaria recorded up to June 1938.

PLATE IV.

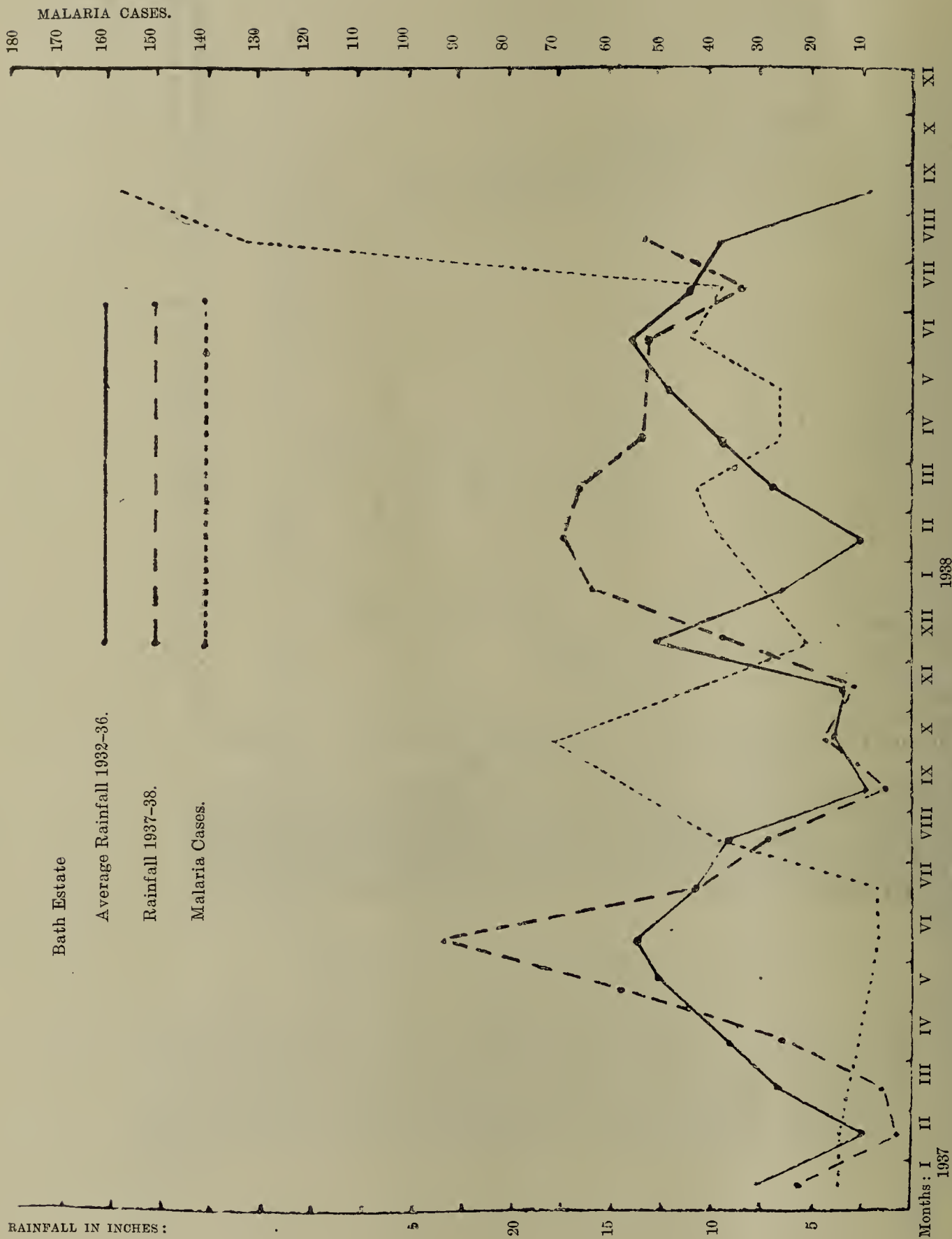


FIGURE 4.—Bath Estate, on the west coast of Berbice, is one of the healthiest in the Colony; its spleen rate, early in 1937 was only 1.5%. During 3 years' observation (1934-36) we found *A. darlingi* very uncommon in this locality. A mild outbreak of malaria occurred in September and October 1937, following the heavy summer rains of that year; a reservoir of malarial infection was thus formed and the disease spread rapidly during the summer and autumn of 1938 when *A. darlingi* appeared in large numbers, having found favourable conditions for extensive and intensive breeding during the exceptional rainy season which lasted from January to August, with an average monthly precipitation of 14 inches. The spleen rate of Bath, at the end of 1938, had risen to 20.8% and the parasite rate to 79.6%. *A. darlingi* disappeared as fast as it had come, and by January 1939, it could only be found with difficulty.

Observations carried out in the interior, on the Demerara River (1923-1932), indicate that the duration of the period intervening between the onset of the rains and the rise in the incidence of malaria varies in inverse proportion to the height of the atmospheric temperature. A high temperature speeds up both the development of the *Anopheles* from ovum to adult, and the evolution of the malaria parasite in the *Anopheles*, i.e., *Anopheles* breed more rapidly and become infectious in a shorter period after feeding on a suitable malarious subject.

Increased nocturnal atmospheric humidity, which accompanies persistent rains, will favour the survival and flight of *A. darlingi* and thus increase its activity and dispersion.

The ubiquitousness of favourable surface waters—resulting from heavy and persistent summer rains—in close proximity of houses and villages, will greatly reduce the hazards which the *Anopheles* must face in its long flights to and from its habitual breeding sites, as they will lay their eggs in the nearest suitable waters and return to the houses repeatedly to procure the blood meals they require; a larger proportion of malaria infected *Anopheles* will, therefore, survive in close proximity of human habitations, and the transmission of malaria inevitably becomes extremely active.

This is the mechanism by which the malarial epidemics of 1926 and 1938 originated both on the coast and in the tidal river districts of the interior.

Diagram II illustrates relations between malarial incidence and rainfall at Mackenzie in 1926.

Diagrams III and IV refer to the malarial epidemic at Skeldon and Bath in 1937 and 1938.

The chronological sequence of the 1938 epidemic outbreaks in Berbice is of special interest; Skeldon, which is situated some 8 miles up the Corentyne estuary, was the first affected; it suffered a mild epidemic in 1937 and again a severe outbreak commencing in June 1938. Albion was the next affected; it suffered both in 1937 and 1938. This plantation is situated further inland than the next, and the yards border on the cane cultivation and on sheltered bush-surrounded rice fields. Port Mourant, which lies further north, in open country, suffered mild epidemics coming on late in August, in both years. Bath was only very slightly affected in 1937 and was the last to be involved in 1938. The outbreak on this coastal estate was sharp and short; *A. darlingi* which was extremely abundant in October had practically disappeared in January.

Malaria, unlike other epidemic diseases, cannot spend itself in the course of a few weeks or months; once the infection is acquired, the disease evolves by relapses; even with the complete disappearance of the *Anopheline* carrier, the consequences of an epidemic continue to be felt for two or three years. Thus the localities of the Corentyne Coast which in 1937 had spleen rates of 2 or 3% now have rates of 32 and 24%; in another locality of the west coast of Berbice, the rate has risen from 1.5 in 1936 to 20.8% in 1938.

If we refer again to Table I, we observe a tendency in the annual rainfall, as registered at Bath, to increase during late years; whereas from 1900 to 1926 atmospheric precipitation reached 90 inches p.a., on only two occasions (1903 and 1907) the maximum recorded being 93.74 inches, from 1927 to 1938, this has occurred no less than 5 times with 104 inches in 1927 and 1936; 115 in 1933 and 128 in 1938.

If this tendency persists malaria will undoubtedly become endemic in many localities which up to the present have enjoyed a remarkable freedom from this disease. This is particularly probable for the West bank of the Corentyne estuary, where the higher level of the land, the low soil salinity, the less active ventilation, the higher atmospheric humidity, the abundance of rice and cane lands coupled with the abundance of bush and free vegetation, are all conditions of themselves favourable to the presence of *A. darlingi*.

PART V.—WHAT MALARIA MEANS TO THE RURAL POPULATION OF THIS COLONY.

The great majority of the rural inhabitants of British Guiana pass their whole existence exposed to the ravages of malaria; they accept the disease as an inevitable necessity. There exists no trace of popular instinct or tradition aiming to avoid the disease by intelligent location of settlements and villages as is usually found amongst indigenous populations of malarial countries.

In the interior only the Aboriginal Indian builds his camp on high ground, on sand or gravel; the immigrant from the coast, of negro, chinese, portuguese, East Indian and mixed race, invariably settles and builds his house on the alluvial and intensely forested and malarial mud flats which form the floor of the river valleys,

Such a state of affairs is comprehensible when we consider that the mass of the present day population of the Colony descends from people brought to the country in the past to fill the requirements of the plantations (cotton, coffee, cocoa and sugar) which have always been the main *raison d'être* of the Colony. These people were made to settle on the fertile alluvial plains, and trained to live where they were required. The habit so formed, in the presence of the very peculiar configuration and hydrological regime of the coastlands, has given rise to a rural population of somewhat amphibian customs!

Amongst the more educated classes, both in the country and towns, ordinary practical knowledge about malaria is remarkably deficient; one notes a frequent tendency to camouflage the disease under other names such as "low fever," "biliousness," etc.

Public opinion in general appears definitely apathetic to Malaria which involves scores of thousands of people and causes, directly or indirectly, thousands of deaths every year, whilst it has shown considerable enthusiasm in relation to such relatively minor health problems as tuberculosis and leprosy which cause only an infinitesimal fraction of the mortality, disability and financial loss, for which malaria is responsible every year.

It may, therefore, be of advantage to conclude this series of articles by the study of certain statistical data we have collected, which vividly demonstrate what malaria really means to a large section of our rural population and to the Colony in general; and what account must be taken of this particular problem in the framing of any plan or scheme for land settlement and further agricultural development.

Our studies have been limited to the population of the sugar estates, which, in 1937 aggregated close on 68,000 persons, *i.e.*, 35% of the total coastal rural population of the counties of Demerara and Berbice. There is no reason to believe that conditions in the villages in the same areas are in any way better; the contrary is more probably the truth, as the villagers, whilst living in localities similarly and often less favourably placed, do not enjoy the advantages of estate residents in the form of free hospital and medical treatment. The sugar estates, in this connection during the last ten years have spent an average of close on \$104,000 per annum on their hospitals only.

In 1938 the sugar estates issued free of charge no less than 422 lbs. of quinine, *i.e.* 27% of the total amount of this drug imported into the Colony in 1937.

Dr. Boyd's recent survey tends to confirm our surmise; one of the highest spleen rates in the Colony was recorded from Lodge Village on the outskirts of Georgetown, and high rates were observed in villages on the East Bank,

It is very difficult to obtain a correct idea of the damage done by malaria from an analysis of morbidity and mortality returns; the great majority of fever cases pass unreported and a great many more are incorrectly diagnosed. Malaria often causes death in its acute form; most of such deaths are undoubtedly registered under the correct diagnosis, but the highest mortality is caused by chronic malaria which entails extensive and varied organic degenerative processes; the clinical picture is complicated and a great many such deaths are registered under diagnoses other than malaria, as for instance, cachexia, marasmus, dropsy, nephritis, debility, senility, etc.

On the sugar estates, an average of 125 out of every 1,000 deaths registered are directly ascribed to malaria; that, in itself, constitutes an alarmingly high rate.

The trend of the *vital index* ⁽¹⁾curve, *i.e.* the ratio of births to every 100 deaths registered per annum, studied in relation to the incidence of malaria, as indicated by the spleen rate, furnishes, we believe, the most reliable index as to the effect of endemic malaria on a community.

(1) The term "Vital Index" has been suggested by Pearl to designate that measure of a population's condition which is given by the ratio of births to deaths within a given time." Of this index this Author states: "It may fairly be said that there is no other statistical constant which furnishes so adequate a picture as this of the net biological status of a population as a whole at any given moment." And again: After much study of it I am convinced that no single figure gives so sensitive a measure of the vitality of a nation or any sub group of people as this does." R. Pearl. Introduction to Medical Biometry and Statistics.—1923.

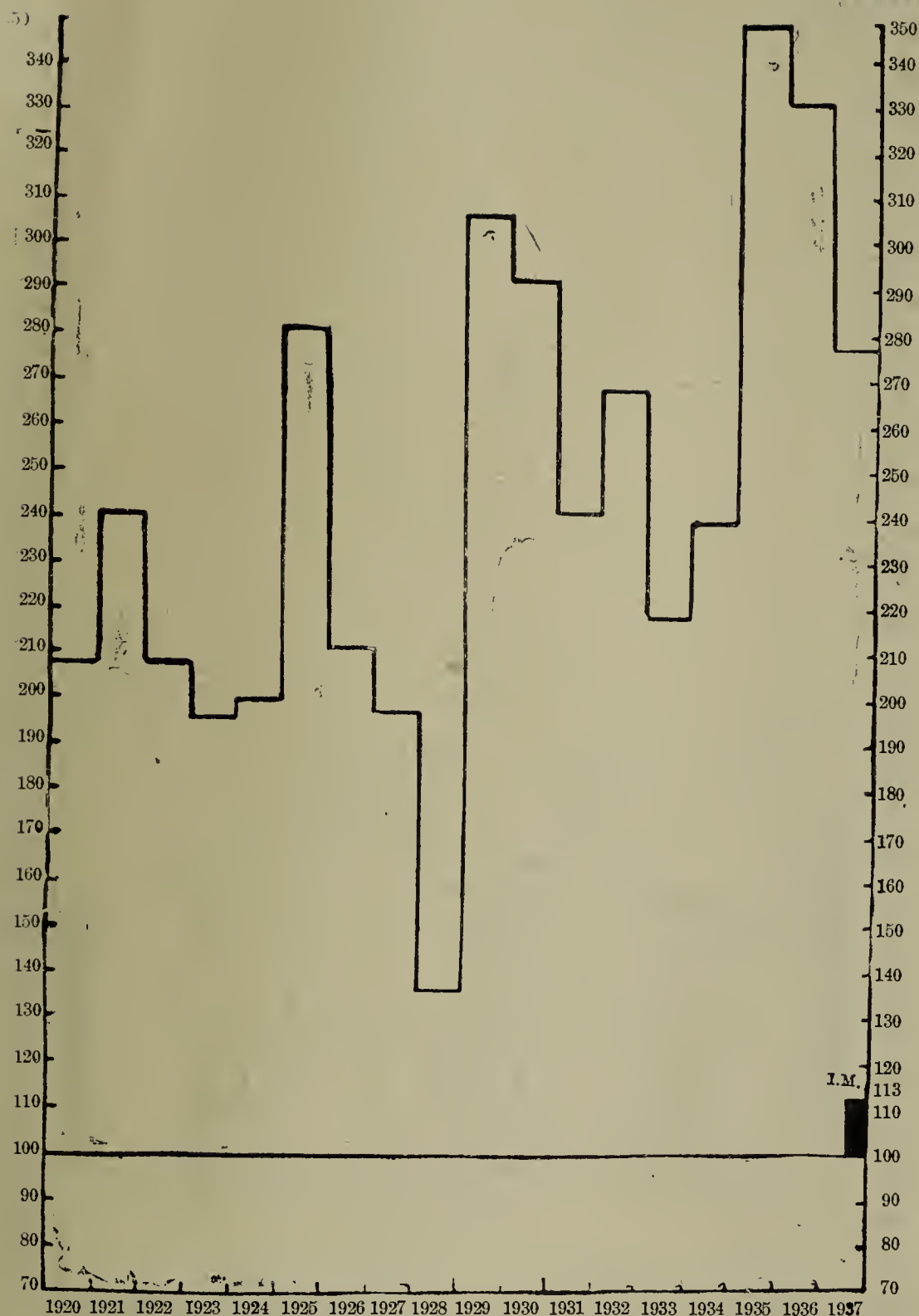


DIAGRAM V.—In this and the two following diagrams, which should be carefully compared, the Vital Index or births to deaths ratio, is studied from 1920 to 1937 over the whole sugar estate population, classified into three groups according to the incidence of malaria as indicated by the spleen rate.

The 100-100 base line indicates 100 deaths; the graph shows the number of births for every 100 deaths registered per annum. When births exceed deaths, the graph runs above the base line; when births are fewer than deaths, then the graph falls below the base line, (see diagrams VI and VII).

The above graph shows the trend of the crude Vital Index on a group of five sugar estates aggregating a population of 20,967, which are free from endemic malaria. As a yearly average from 1920 to 1937 there were 244 births to every 100 deaths, births being constantly and considerably in excess of deaths.

The average annual infant mortality (I.M.) was 113 per 1,000 live births.

PLATE VI.

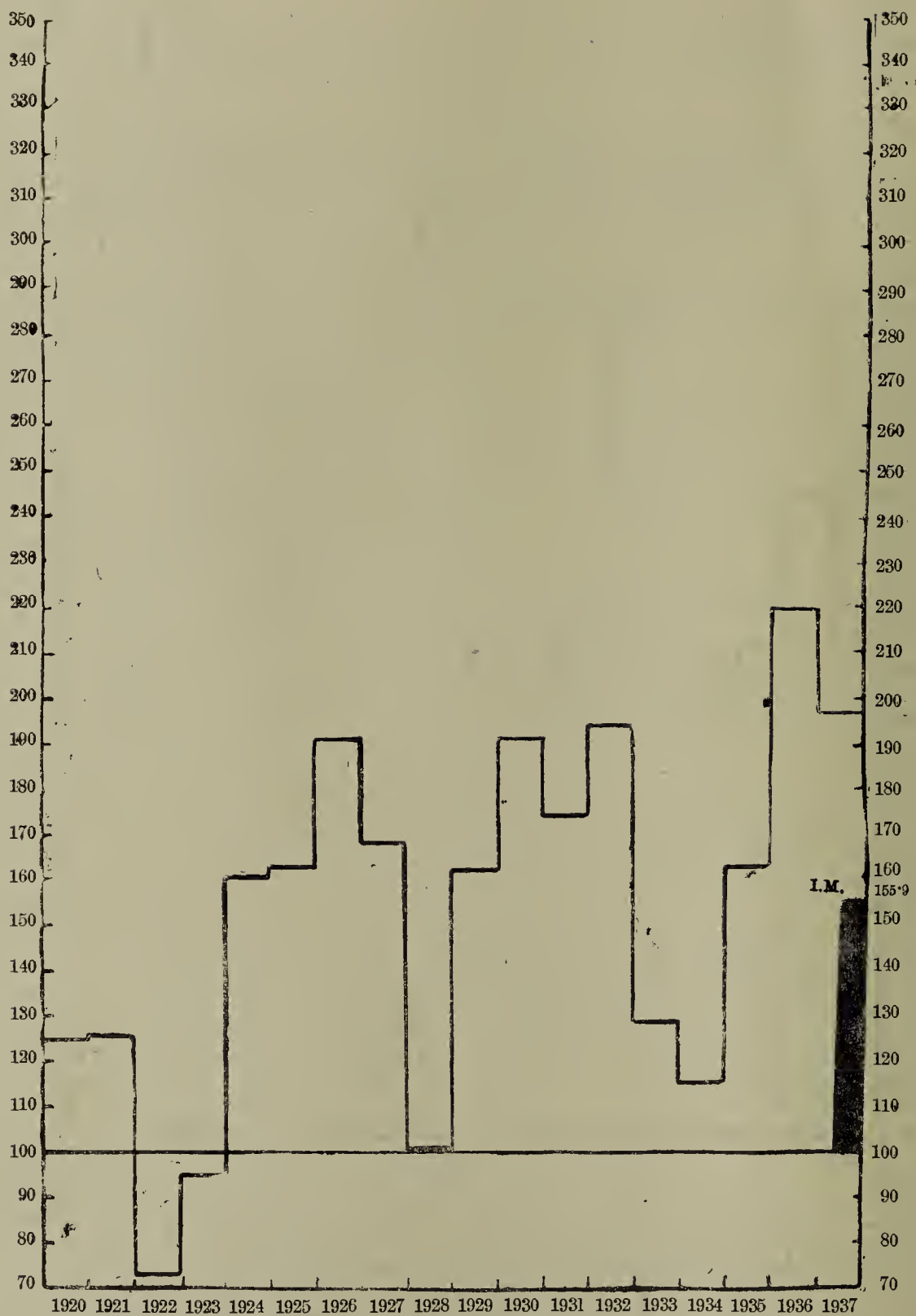


DIAGRAM VI.—Crude Vital Index curve, 1920-1937, from a group of 10 Sugar Estates, aggregating a population of 29,832, which are subject to endemic malaria, (spleen rate from 5 to 30%). As an average for the whole period there were 152 births to every hundred deaths. In two years there were more deaths than births. The average annual Infant Mortality (I.M.) was 155.9.

PLATE VII.

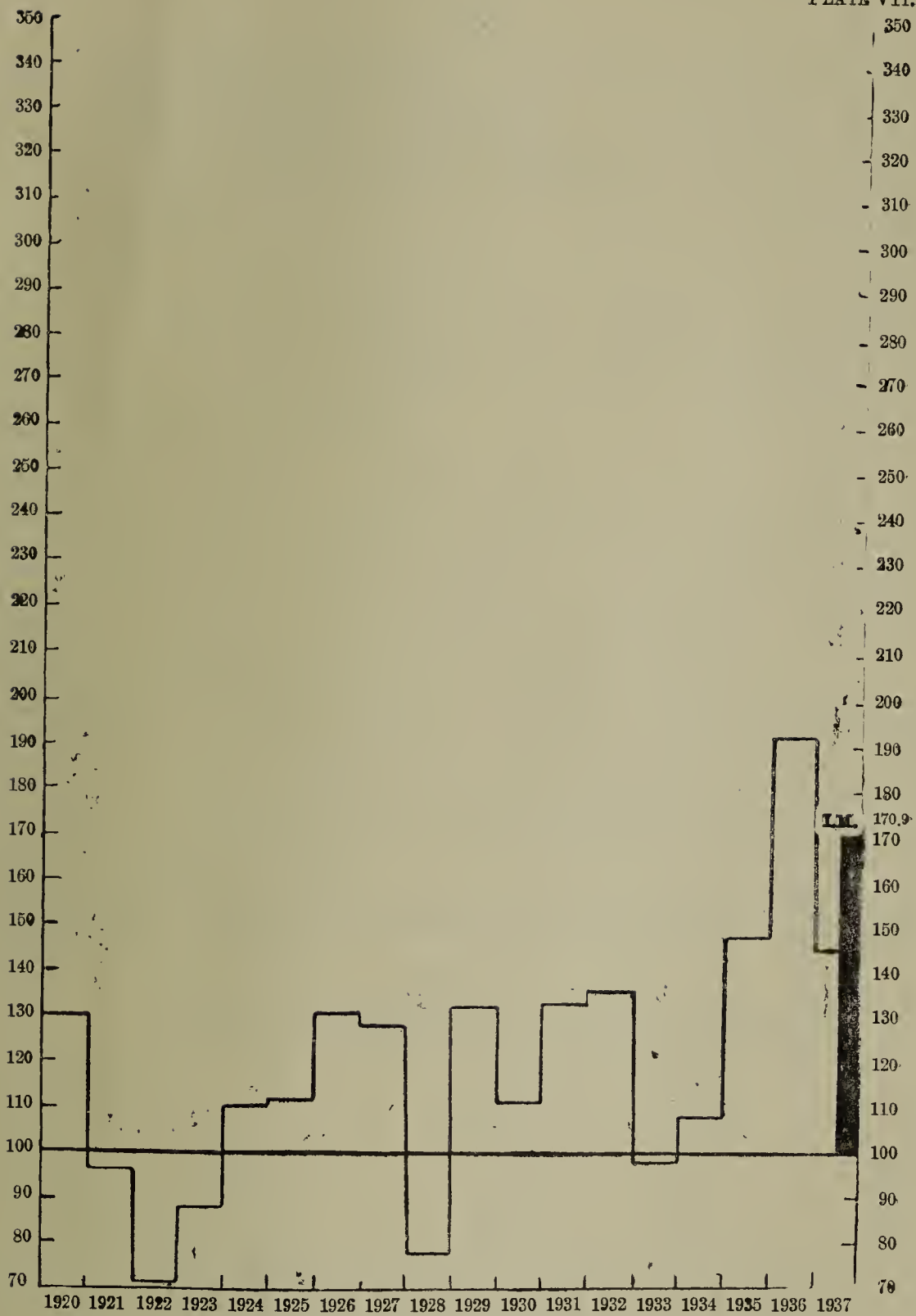


DIAGRAM VII—Crude Vital Index curve, 1920-1930, from a group of 7 Sugar Estates, aggregating a population of 15,876, which are subject to severe endemic malaria (spleen rate 30 to 60%). As an average over the whole period there were 119 births to every hundred deaths. In five years there were more deaths than births. The average annual Infant Mortality (I.M.) was 170.9 per 1,000 live births.

We have carried out such an investigation on all the sugar estates of the Colony from the year 1920 to 1937, classifying them in 3 groups (A, B and C) according to their spleen rate as determined in 1937, *i.e.* before last year's epidemics.

Diagram No. V refers to 5 estates (group A) aggregating a population of 20,967 (Plantations Diamond, Bath, Albion, Port Mourant and Skeldon) all of which, under average conditions, are practically free from endemic malaria. In 1937 all these estates had spleen rates ranging from 0.1 to 5%.

Throughout the 18 year period covered, the number of births on these estates was constantly and very considerably in excess of the number of deaths; as an average there were 244 births to every 100 deaths. The curve has a very marked upward trend. In the early part of 1926 a severe epidemic of malaria swept the Colony (see Diagram II); it appears likely that this epidemic was connected with the fall in the *vital index* which occurred in 1927 and 1928. In that case we may expect to witness again a similar fall during 1939 and 1940 as a result of last year's epidemics.

Diagram No. VI illustrates the vital index curve from 1920 to 1937 for 10 estates (Group B) aggregating a population of 29,832 (Plantations Uitvlugt, Leonora, Versailles, Providence, Farm, Vryheid's Lust, Non Pareil and Enmore) which are subject to endemic malaria, with spleen rates not exceeding 30%. We observe that the general level of the curve has fallen very considerably (compare with Diagram V). In two years, 1922 and 1923, there were actually more deaths than births, and in 1928 the two just balanced. As an average, for the whole 18 year period, there were 152 births to every 100 deaths *i.e.* a fall of 92 births from the average shown by the non-malarial estates included in Group A.

Diagram No. VII gives the vital index curve from 1920 to 1937 for seven sugar estates (Group C) aggregating a population of 15,876 (De Kinderen, Wales, Ogle, La Bonne Intention, Lusignan, Blairmont and Providence, Berbice) on all of which malaria is highly endemic the spleen rate being constantly above 30%. The curve shows a fall to yet a lower level when compared to the two proceeding diagrams and in five years out of 18 (1921, 22, 23, 28 and 1933) there were more deaths than births. For the whole period, as an average, there were only 119 births to every 100 deaths, *i.e.* a decline of 125 births on the average of the non-malarial estates included in Group A.

In Table II we present certain other vital statistical data, referring to the 1932-37 period and to the sugar estate population of the whole Colony classified according to the spleen rate, as above, into 3 groups, A, B and C.

TABLE II.

Malaria Rate in relation to birth rate, maternal mortality, infant mortality, and stillbirth rate, annual averages 1932—1937.

Estate Group	A	B	C
Population ...	20,967	29,832	15,876
Spleen Rate ...	Under 5%	5% to 30%	Over 30%
Average Annual Birth Rate ...	32.1	25.0	26.7
Maternal Death Rate ...	10.6	21.4	21.2
Infant Mortality ...	113.0	155.9	170.9
Stillbirth Rate ...	47	78	92

These figures indicate that the population of the malarial areas is less fertile as shown by the decline of the birth rate in parallel with the increase of the spleen rate.

The hazards of child bearing are similarly increased as shown by the twofold rise in the maternal mortality and the stillbirth rate in groups B and C.

The chances of survival of the infants decrease as the malarial rate rises; the same could be said for young children between 1 and 4 years of age.

These diagrams and statistics indicate most clearly how deeply malaria affects a population: its ravages are not limited to the morbidity and mortality it determines: the very vitality of the community is involved and its normal tendency to reproduce and expand inhibited. Such a loss of vitality inevitably reflects itself on the productiveness, *i.e.* on the economic value of both the individual and the community.

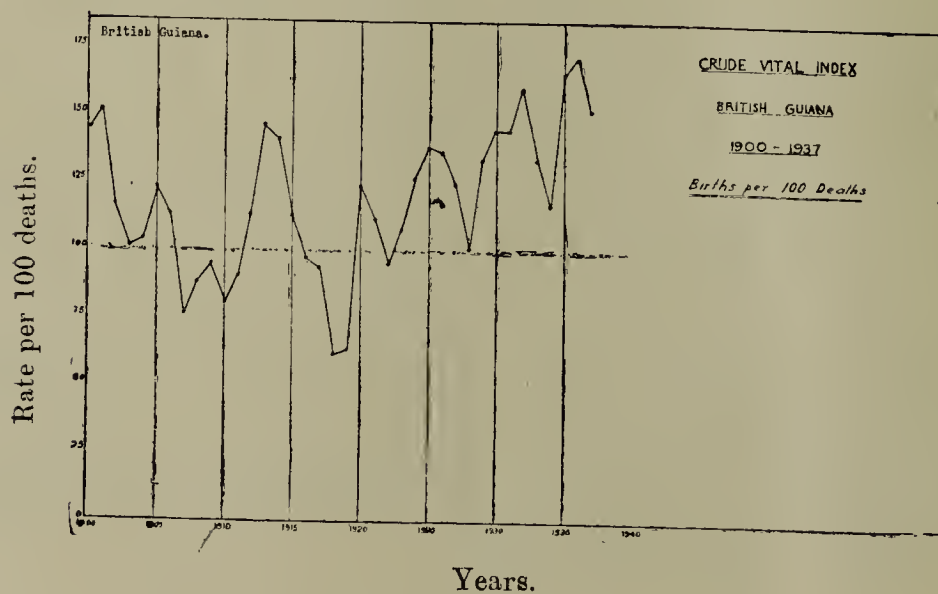
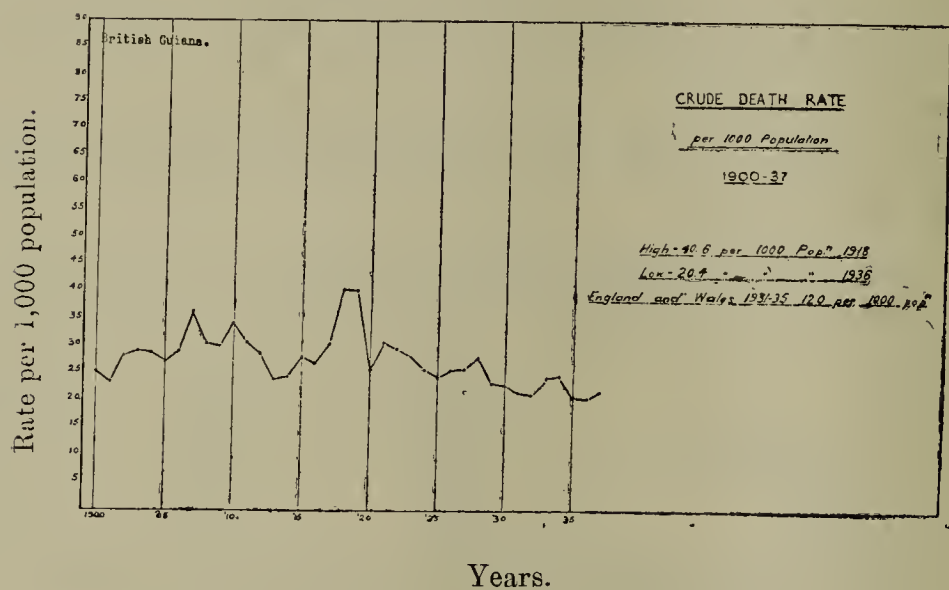
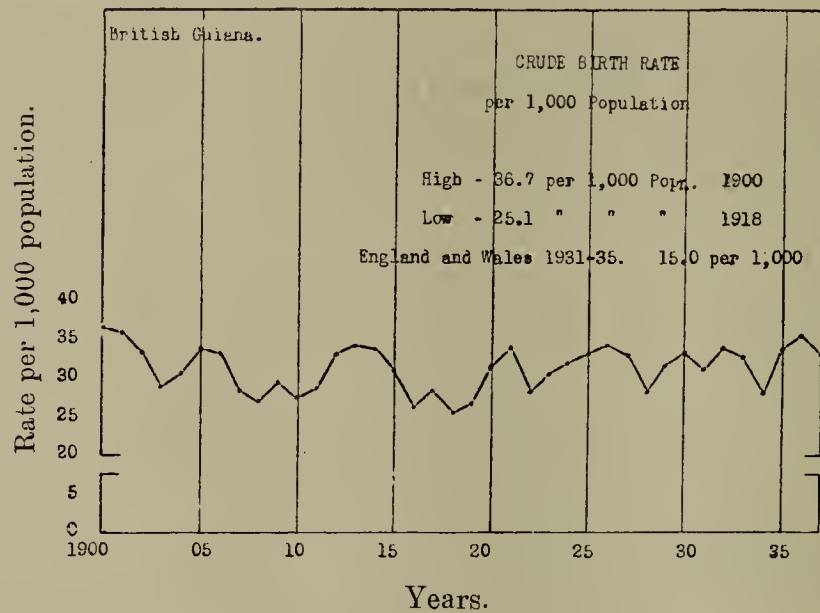
In British Guiana with its peculiar geographical, climatological and exceptional hydrological conditions the malarial problem, as we have shown, presents itself as one of unusual magnitude and with characters which are probably unique; it is intimately connected with the two basic agricultural industries of the Colony.

In spite of such difficulties we feel confident, on the base of our findings, which have revealed certain limitations in the biology of *A. darlingi* which may be exploited to its detriment, that malaria can be successfully controlled if not eradicated in a considerable portion of the inhabited coastland of this Colony.

APPENDIX III.

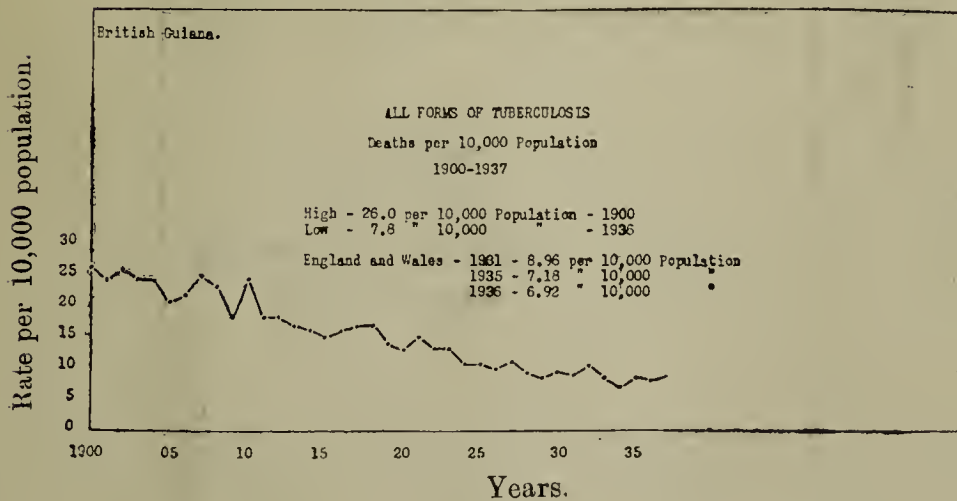
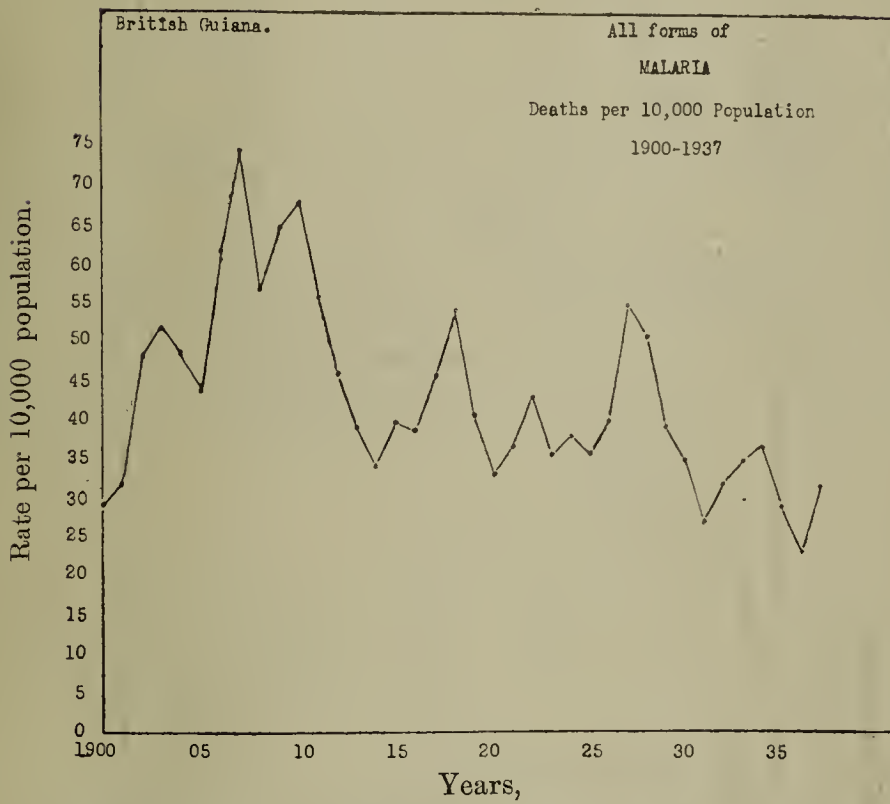
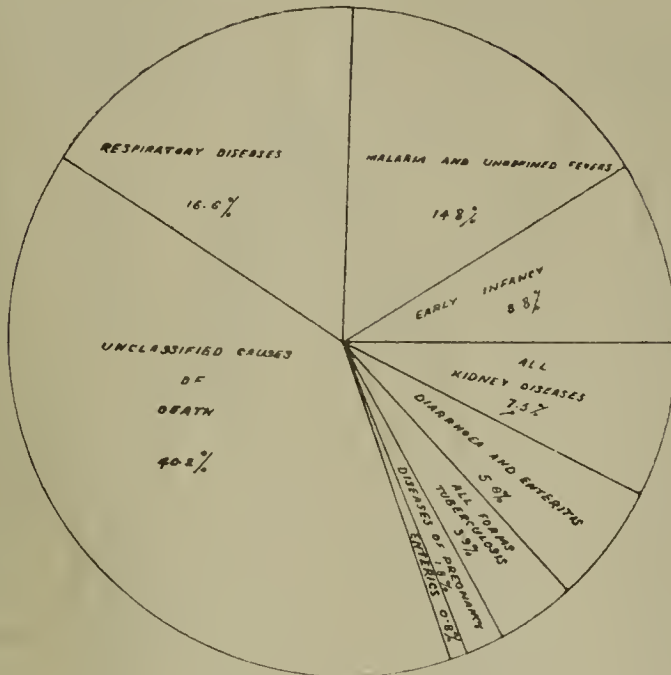
SUPPLEMENT—VITAL STATISTICS—1900—1937.

Certain Graphic material derived from a reported summary for the period 1900—1937 published in the Report of the Registrar-General, 1938, may be appropriately included here for record purposes and restricted comment.



DISTRIBUTION OF SELECTED SPECIFIC CAUSES OF DEATHS, 1928-37 PER 100 DEATHS FROM ALL CAUSES.

BRITISH GUIANA.



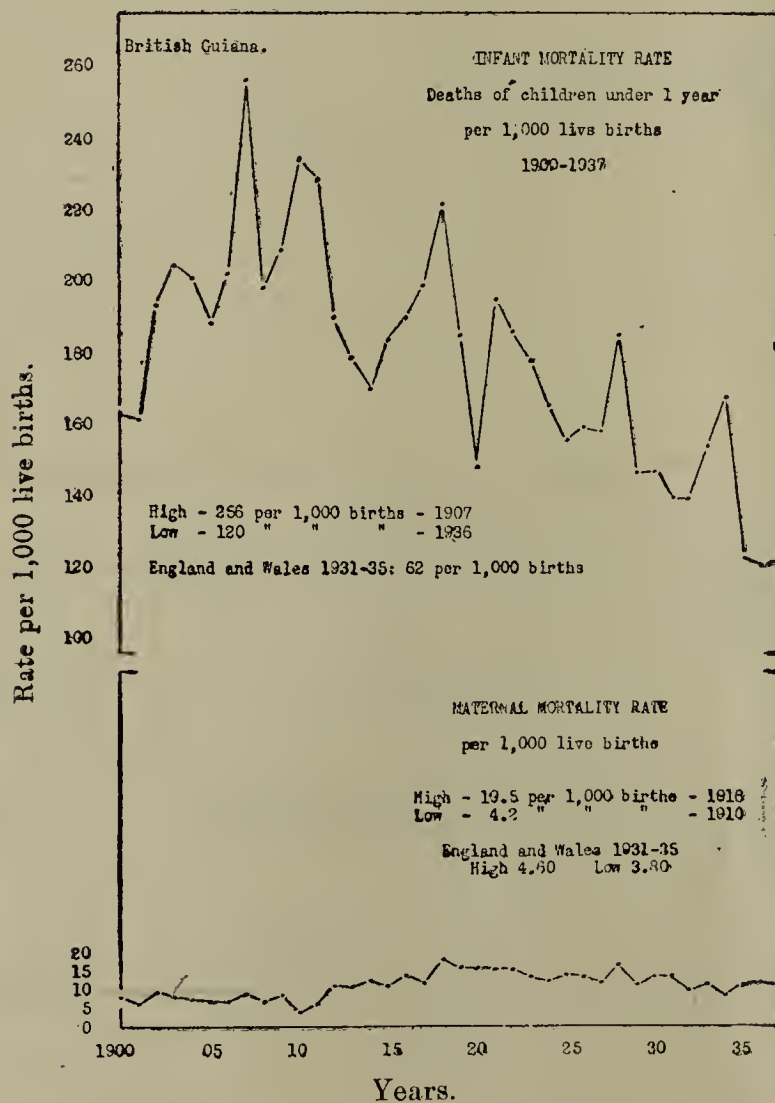


TABLE.

Year.	Crude birth rate per 1,000 population.	Crude death rate per 1,000 population.	Crude Vital Index: birth/death ratio (per 100 deaths).	Specific Mortality Rates.					Estimated Population.	
				All forms of Malaria.	All forms of Tuber- culosis.	Typhoid and Paratyphoid Fevers.	Infant Mortality rate(per 1,000 births)	Maternal Mortality rate per 1,000 births.		
										(per 1,000 population).
1900	...	36.7	25.3	145	29	26	0.06	164	7.5	294,943
1901	...	35.9	23.6	152	32	24	0.23	162	7.0	300,748
1902	...	33.4	28.1	119	48	26	0.10	194	8.5	302,172
1903	...	29.0	28.9	100	52	24	0.07	205	8.2	302,628
1904	...	30.3	28.8	105	49	24	0.19	201	7.5	301,923
1905	...	33.6	27.4	122	44	21	0.13	187	6.7	303,390
1906	...	32.9	28.8	114	62	22	0.46	202	6.7	306,959
1907	...	23.3	36.9	76	75	25	0.26	256	9.3	304,549
1908	...	27.3	30.8	88	57	23	0.86	198	6.2	304,089
1909	...	29.3	30.0	96	65	18	1.08	209	7.6	305,090
1910	...	27.5	34.4	79	68	24	1.88	235	4.2	303,197
1911	...	28.8	31.7	91	56	18	2.57	229	6.1	295,784
1912	...	33.1	29.2	113	46	18	3.10	190	11.4	299,044
1913	...	34.6	24.2	143	39	17	3.50	179	11.5	304,149
1914	...	34.4	24.5	140	32	16	2.80	170	13.8	309,938
1915	...	31.3	27.7	113	40	15	2.40	184	12.7	312,391
1916	...	26.5	27.1	98	39	16	2.90	190	14.2	313,859
1917	...	28.4	30.4	93	46	17	3.90	199	12.3	313,999
1918	...	25.1	40.6	62	54	17	4.10	223	19.5	310,972
1919	...	25.9	40.4	64	41	14	3.70	185	15.8	305,991
1920	...	31.9	25.6	124	33	13	4.50	148	15.4	307,290
1921	...	34.5	30.9	112	37	15	4.00	195	15.4	298,188
1922	...	27.8	29.1	97	43	13	3.10	186	15.4	297,817
1923	...	30.4	28.3	107	36	13	3.90	177	14.8	299,199
1924	...	32.4	25.6	127	38	11	3.00	165	12.8	301,204
1925	...	33.5	24.2	139	36	11	2.60	155	13.5	304,412
1926	...	34.7	25.5	136	40	10	3.30	159	13.5	306,844
1927	...	32.6	26.0	124	55	11	2.90	158	12.6	308,473
1928	...	28.3	27.9	102	51	9.2	1.90	185	17.6	307,784
1929	...	31.7	23.5	135	39	8.8	1.40	146	11.5	309,676
1930	...	33.4	23.0	146	25	9.2	1.70	139	12.7	312,489
1931	...	31.4	21.8	143	27	9.2	1.70	139	14.9	313,619
1932	...	34.1	21.1	162	32	10.1	1.40	139	10.0	317,813
1933	...	32.6	24.4	135	35	8.7	2.10	154	11.1	321,260
1934	...	28.8	24.7	116	37	7.8	2.60	168	7.6	323,171
1935	...	34.3	20.6	167	29	8.3	2.10	122	11.0	323,219
1936	...	35.3	20.4	172	23	7.8	3.40	120	13.7	332,898
1937	...	33.3	21.9	151	32	8.8	1.90	121	12.8	337,059
1938*	...	29.7	25.8	115	39.8	8.2	1.80	166	15.2	337,521

*Not shown on graphs.

1. The trend of the crude birth rate is relatively constant. The annual fluctuations doubtless are reflective of the fact that complete registration of births has not yet been attained. The cyclic fluctuations have probable reference to the epidemic prevalence of diseases which tend to reduce fecundity. Such information as is available indicates that the acute respiratory infections and malaria may be responsible for these cyclic variations. In general the birth rate may be considered as high.

2. Registration of deaths except in the remote hinterland is doubtless more complete than that of births. These rates are also high and give more striking evidence of cyclic variations. The trend since the influenza epidemic of 1918-19 has been downwards.

3. The foregoing features are more graphically evident in the Crude Vital Index curve wherein despite the adverse cyclic recessions in natural increase an improving trend in this factor is to be noted.

4. The relative significance of the disease groups as causes of death over the decennium 1928-37 was compiled from selected diseases and does not necessarily represent the true array of the chief causes of death. The selection was based upon the reputedly important diseases in the Colony.

5. It is not clear that the malaria mortality curve represents a decline in the importance of this disease in the Colony. Other evidence would suggest that the indenture system having ceased, the population as a whole has become more stabilised, or more tolerant to the acute effects of infection from the local strains of the plasmodia. It may be postulated that the deaths due directly to acute malaria have become less and that deaths occurring from unrecognised sequelae of chronic malaria do not have record under that cause. The opinion is expressed that either the virulence of the plasmodia to be found in British Guiana has become attenuated or the population is acquiring a degree of immunological tolerance. Contemporary malaria control, personal and environmental, is ignored to such an extent that it is not possible to conclude that the relatively isolated efforts of this nature offer an explanation of the trend indicated by the curve.

6. Tuberculosis shows a continued declining trend which one would like to consider as the result of specific control efforts. Study of the available data suggests there is reason to believe that there is a notable natural decline in the disease such as has been reported from the north.

7. The mortality rates of the enteric group will be noted to be on a different scale than the other specific mortality rates. It is believed that this curve represents the diagnostic activities and facilities of the Central Bacteriological Laboratory rather than the true mortality from these diseases.

8. With a high birth rate there continues to be a high infant mortality rate which shows a very definite declining trend, suggesting that some effect may have resulted from the active infant welfare work that has been in operation since 1914. It cannot fail to be observed, however, that the cyclic deterioration in these rates have a very intimate correlation with the malaria mortality rate. First impressions of this declining rate may be considered to be reflected in the Vital Index Curve. Study of the correlations of these two factors indicates that the malaria mortality factor is more significantly related to the improving vital index than the infant mortality factor.

The trend of maternal mortality indicates a most unsatisfactory position wherein such effect as may have resulted from infant welfare work has had practically no similar effect upon the hazards of childbirth, despite the fact that this important aspect of the general problem has had inclusion in the programmes of the voluntary society concern with this work. Elsewhere comment has been made upon some angles of this situation.

